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# BREAKING ON THROUGH

## Micros move into the fast lane



Oric Destroyer

Bipods and Panel on ZX-81

QL controversy: Sinclair's new ROM antic

Creepy-crawlies for Dragon and CBM-64

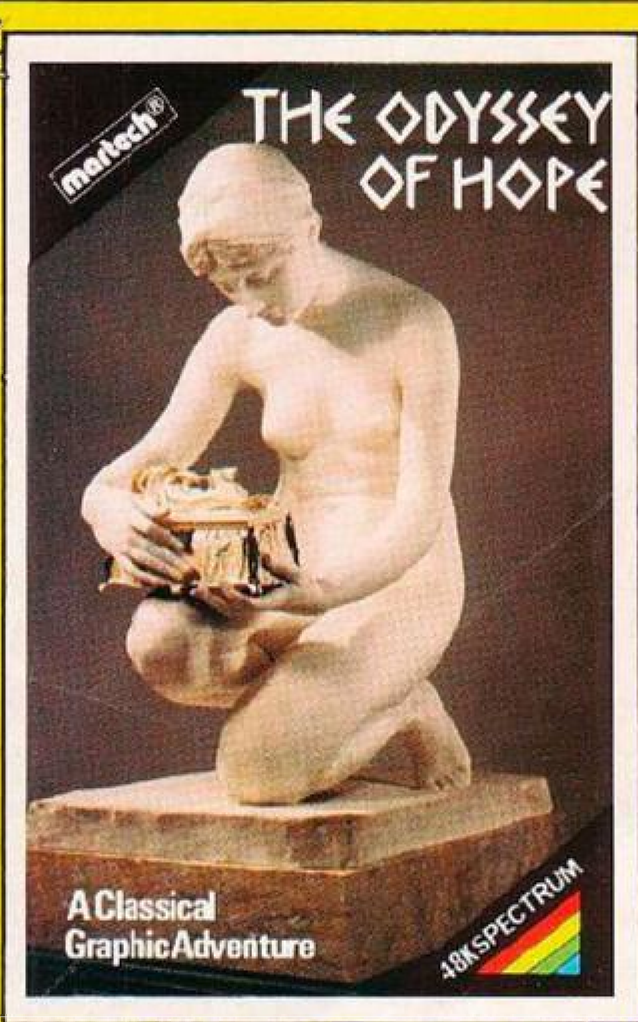
Software — Spectrum tapes, BBC Plug-ins

Vic Jetman and Hi-res Drawer

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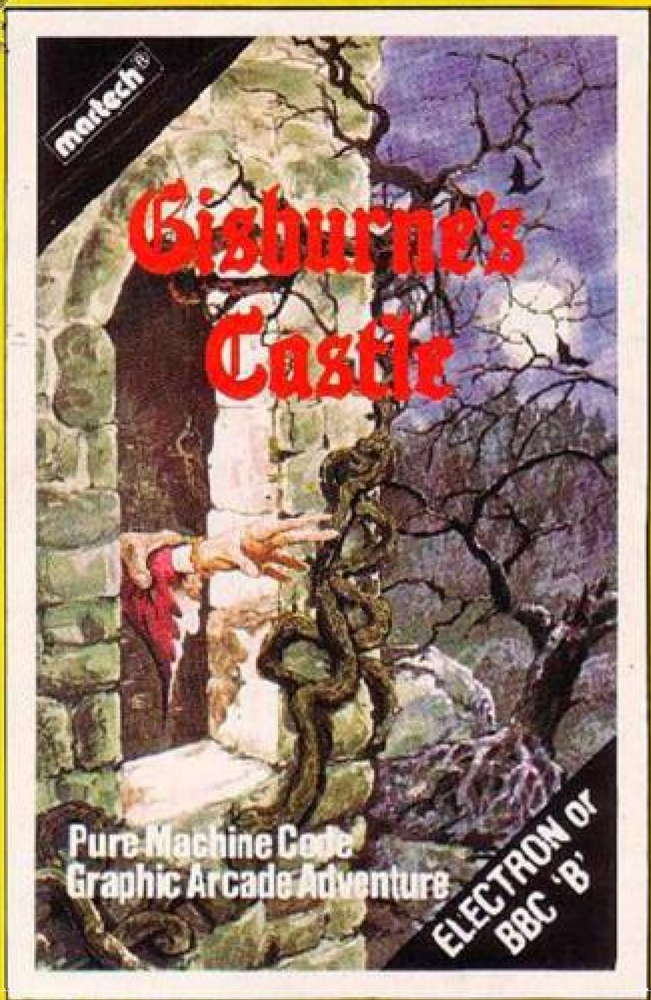
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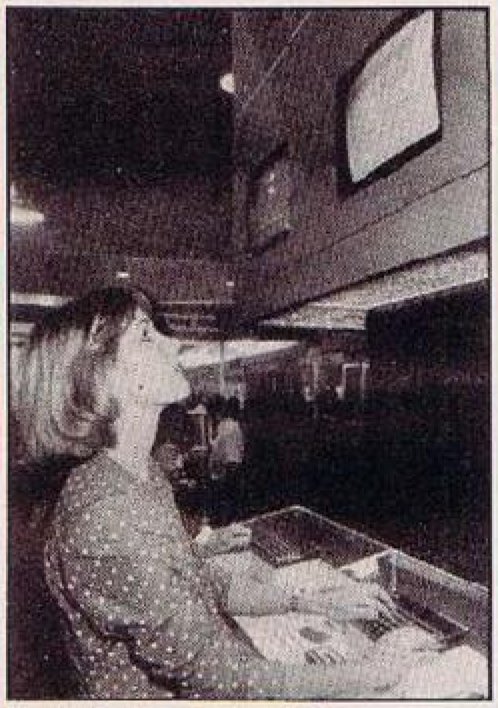
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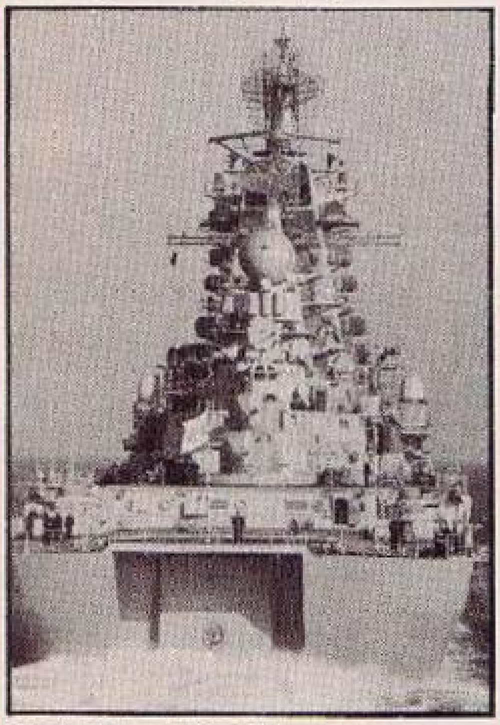
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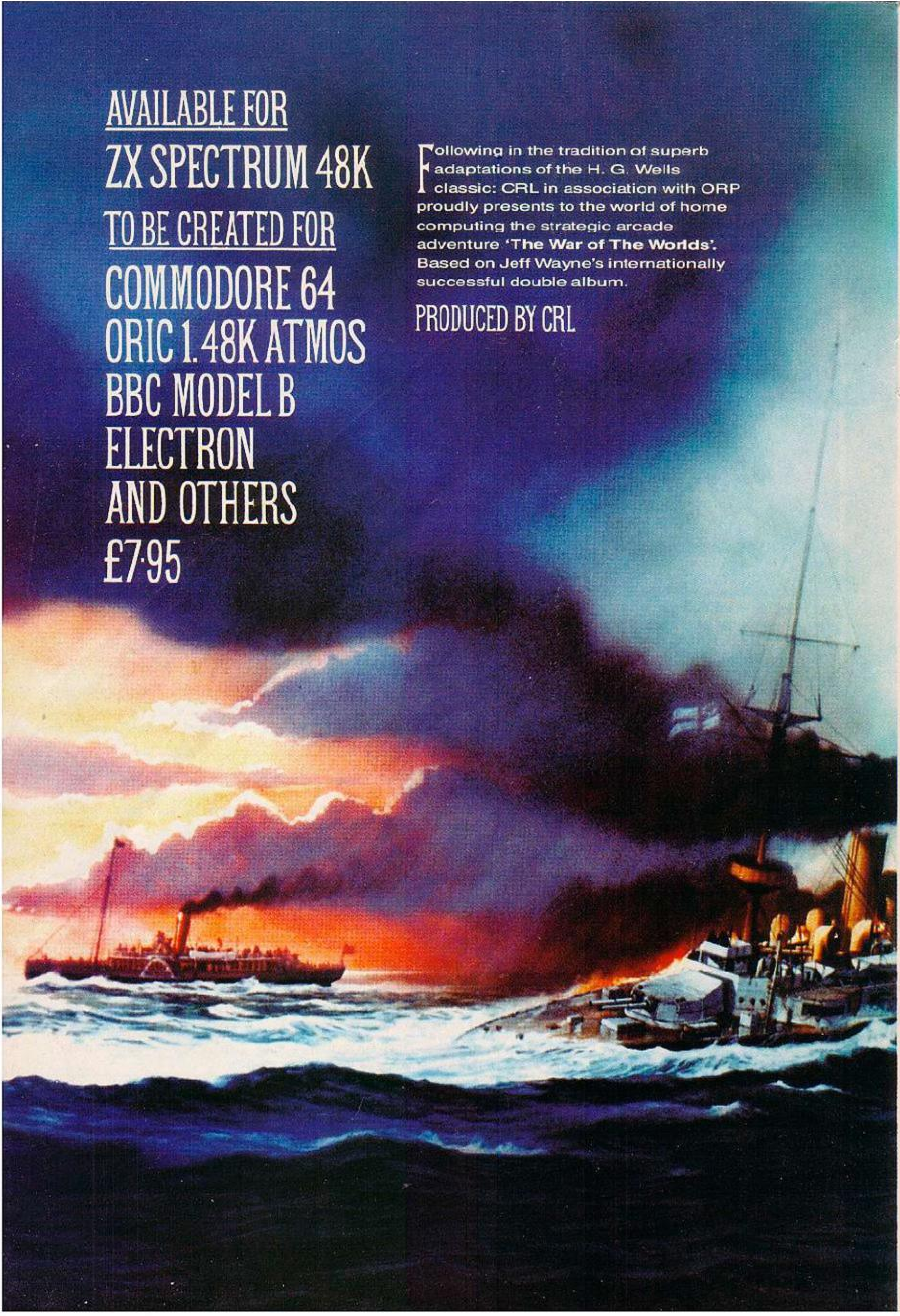
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Destroyer — page 114


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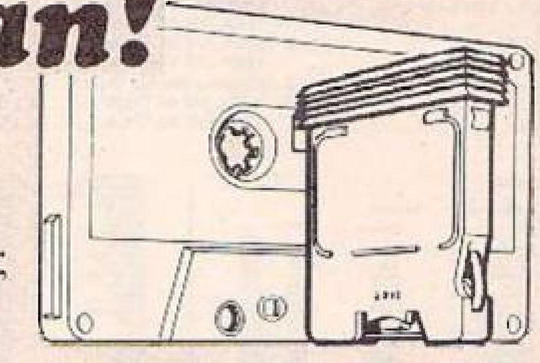
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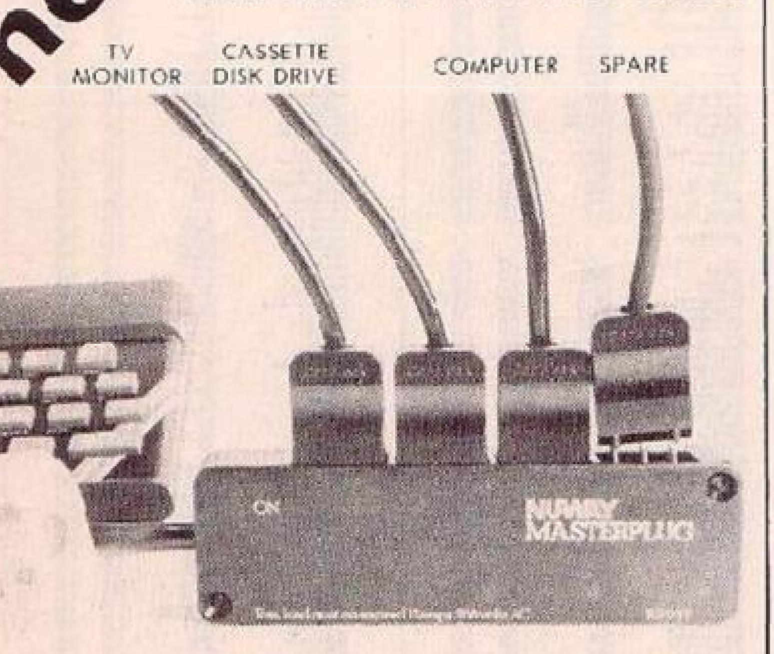
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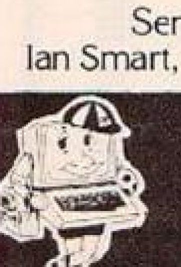
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ANI
Graphics — This program enables you to paint and draw on the screen by controlling a simulated pencil and brush which can be manoeuvred either by keyboard or joystick. This utility can be used to create and edit background pictures stored in half the normal memory space by use of innovative data compression techniques. Together with its automated drawing techniques; circle, line and centring routines; background colour options, and tape load and save choices; this makes the creation of an artistic wonder possible for ALL USERS.
Animation — The animation utility allows easy manipulation of sprite data pictures, several sprite designs, and a multitude of musical compositions and everyday sounds. This facility is a compilation of all the facets of the graphic and sound utilities.



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Sound — This section of the package turns your Commodore 64 into an intelligent synthesiser on which you can choose to play solo or duet on a piano, organ, harpsicord, xylophone, harp, bagpipe, harmonica, violin, banjo and flute with variable tempo and pitch. The sound routine includes replay, store, fetch, load and append options, so making the composition of superb audio effects an extremely simple task.
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B




**FOR THE BBC 'B'**
**Wonder Worm** by Kevin Bramhill
Help Wally the worm turn into the mighty Wonder Worm by moving him around his garden eating the special pore as he goes. But beware not everything in Wally's Garden is friendly as you will soon find out.

C




**FOR ANY 48K SPECTRUM**
**Gremlins** by Chris Kerry
Uranium has become the main fuel for Earth. Unfortunately Earth's supply of Uranium is dwindling fast. Jupiter has unlimited supplies of the precious metal, only one problem faces the Intergalactic miner robots from earth: GREMLINS.

D




**FOR ANY SPECTRUM**
**Night Stalker** by Frankie Dunn
While working on a top secret experiment for the government Professor Amron dropped some of his special formula onto the floor. Within minutes, the insects that were on the floor, became noticeably large.
Your mission, to kill the insects before they can breed, but beware of the deadly Centipede.

E




**FOR ANY 48K SPECTRUM**
**Jack and the Beanstalk**
by Chris Kerry
Will Jack get the riches from the Giants castle without being stomped on. Will he climb the beanstalk without falling off; only you (and Jack) will know as you rush around looking frantically for the treasures you desire.

F




**FOR THE 3K OR 8K EXPANDED VIC 20**
**Luv Bug** by John Parker
Dudley is a bit of a Romeo, now try telling that to his girlfriend Bertha; she'll kill you. And that's what she intends to do to Dudley if she ever catches him. Linda is the new woman in Dudley's life and Dudley will need all your skill to help him avoid Bertha and still see Linda. Oh for the joys of Love!

G




**FOR THE BBC 'B'**
**Blocker** by Martin Sykes
Poor Oswald is trapped inside a video game by the evil arch enemy the Bomber. His only chance of survival lies in your hands as you guide him around his ever decreasing grid.

H




**FOR ANY SPECTRUM**
**Spider's Web** by Peter Milne
Micky is a greedy little spider. He traps lots of Flies and Wasps on his web and then stores them to eat later but it's tough for Micky, as the Flies bite back.

I




**FOR ANY SPECTRUM**
**Mega Fruit** by Bob Hitching
This is the ultimate fruit machine with all the features of the real Arcade machines, such as Nudge, Hold, Gamble etc.

J1 VIC 20 J2 CBM 64




**FOR THE UNEXPANDED VIC 20 and the CBM 64**
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**3D Silicon Fish** by Chris Stamp
Sillo has to collect Silicon and return to Earth before the Krlyon destroys him. Will he make it and collect his reward? Only you can tell.

K




**FOR THE BBC 'B'**
**Pyramid Painter** by Chas Smith
Can you help Bert the painter finish off the pyramids before the balls or Thin Man finish him?

L




**FOR THE BBC 'B'**
**Desperate Dan** by Reiner Djerkeli
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# The new Electron from Acorn. Ask any child at school why it's worth £199.



Most British children have one thing in common with the new Electron microcomputer: they speak the same language.

You see, the Electron is the first micro remotely in this price range to use BBC Basic, the computer language that is rapidly becoming the standard in British schools.




But that's not all. Most children will feel at home with the Electron as soon as they lay hands on it.

This is because it has developed out of the Micro that has been chosen by over 80% of schools participating in the Government's current Micros In Schools project. It has a similar keyboard and has most of the functions of this much acclaimed (but naturally, more expensive) machine.

So now children will be able to continue their computer studies at home. They'll be able to use the same educational programs they use at school. And, if asked nicely, they'll be able to help willing adults take their first steps into computing.

All this for only £199.

## A micro technology break-through.

And now a few reasons for adults why the Electron is such an exceptional machine at the price.

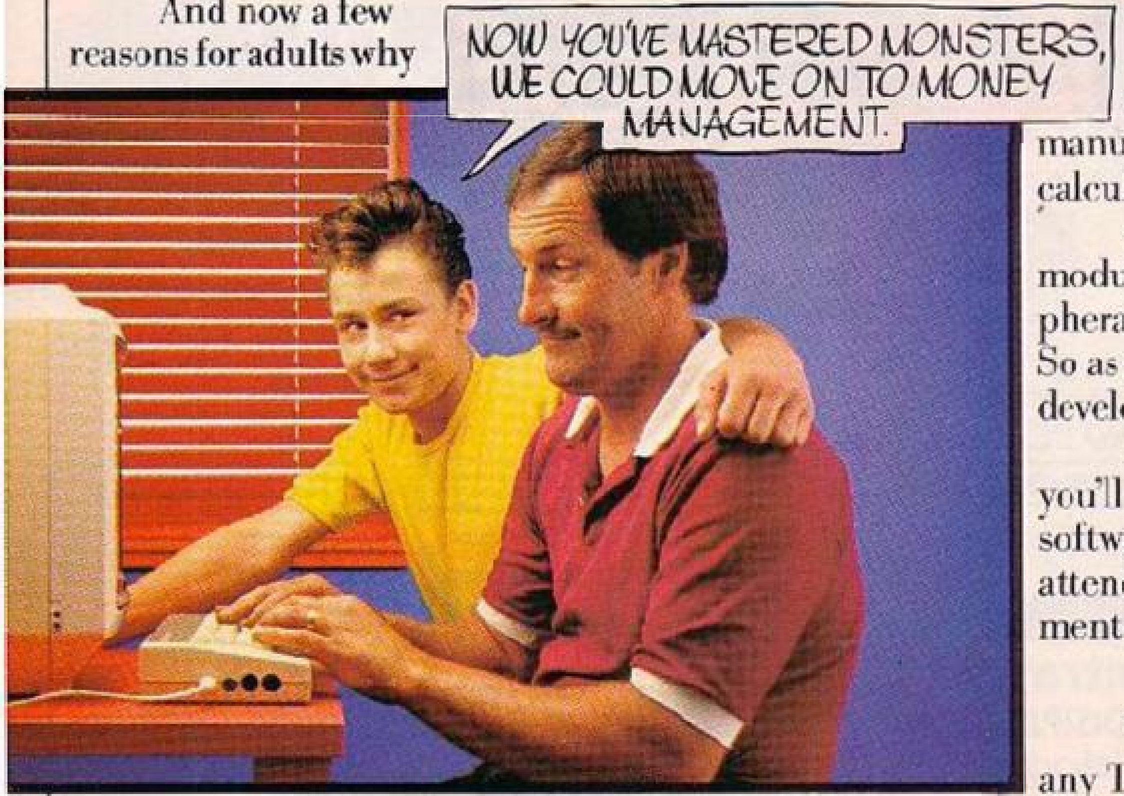
The Electron is neat and compact. Yet it is fast and powerful. (Full details, for the technically minded, are in the box opposite.)

It produces high quality sound using its own internal speaker.

And it offers a range of facilities many larger more expensive machines just cannot match.

For example the Electron's colour graphics have the highest resolution of any home computer.

This is because the chip that controls the graphics, specially designed by Acorn, is one of the most advanced of its kind. As a result, the Electron delivers twice as many characters across the screen as its closest competitor.




## Built to last and to grow.

The Electron has been designed and built to be a permanent part of the family, year in year out.

Particular care has been paid to the keyboard. It is electric typewriter style: robustly constructed with a good, solid 'feel.' It has a space bar, and single entry keys for key commands.

In other words it's comfortable and easy to use, avoiding the need for the manual gymnastics sometimes associated with calculator style keyboards.

And it will grow with you via expansion modules, that Acorn are developing, to take peripheral additions such as printers and disc drives. So as your knowledge, interest and ambitions develop, the Electron can develop with you.

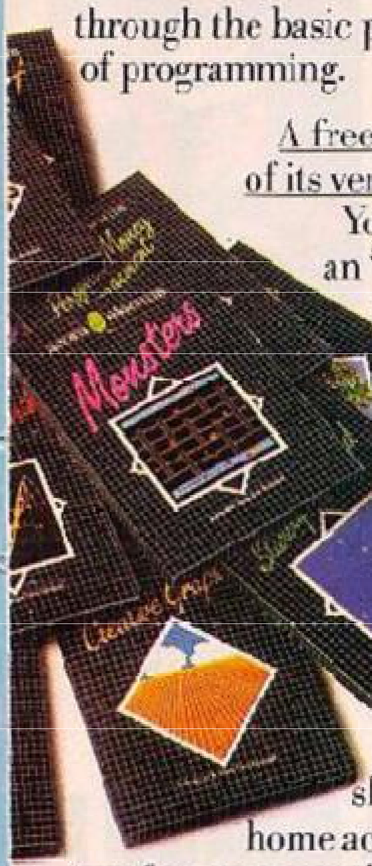
Additionally, to give you all the support you'll need to generate your own applications software, we've established a phone-in service attended by specialists to give advice, encouragement and practical help.

## A gentle teacher.

The Electron plugs straight into virtually any TV set and cassette player so you will be

ready to go as soon as you get it home.

It comes not only with a comprehensive user guide, which describes the machine and its functions, but also with a book that takes you step by step through the basic principles of programming.



A free taste of its versatility.

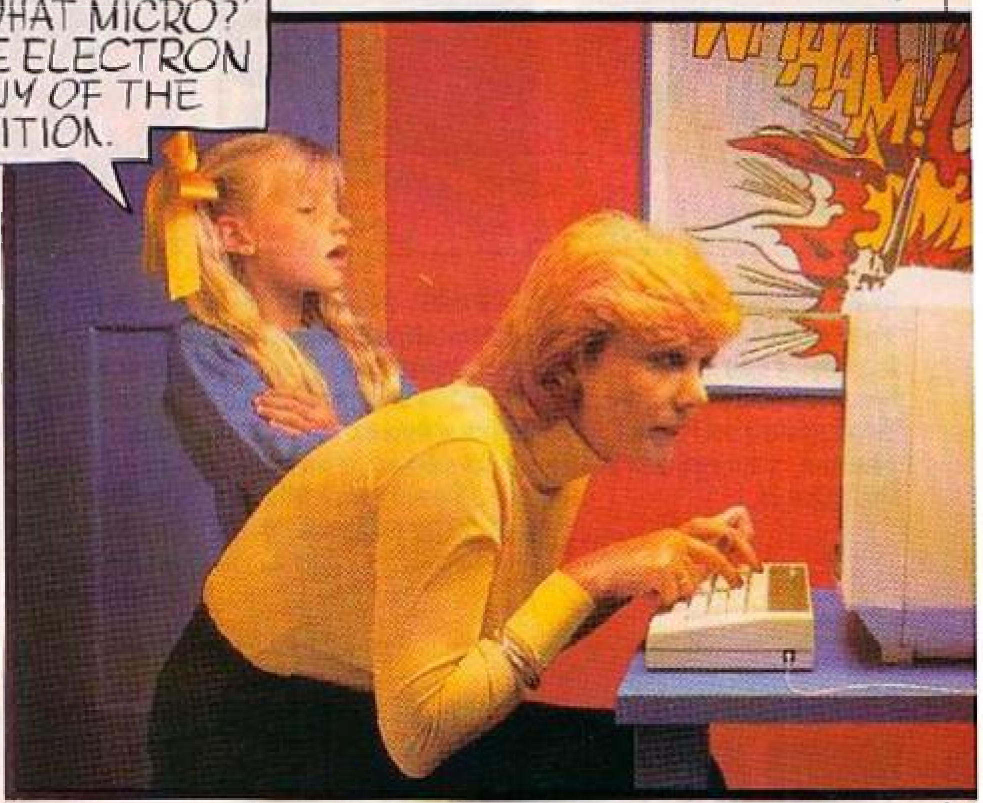
You will also receive an "Introductory" cassette which will put the Electron through its paces showing you a little of what it can do with its 64k of memory (32k ROM, 32k RAM).

The cassette will give you a taste of those exceptional colour graphics we mentioned earlier; of its ability to play and notate music, and show you how it might help in home accounting. It will challenge you to a few games and will, if you ask it, do your whole family's biorhythms in a matter of seconds.

You will in short, through the 15 separate programs it contains, get a glimpse of the Electron's potential. But only a glimpse, for that potential is as limitless as your own interest and imagination.

A widening range of software.

To help you realise some of that potential, Electron software already ranges from "Personal Money Management" through "Starship Command" to "Creative Graphics" (which, incidentally, includes some spectacular three-dimensional rotating shapes). Naturally, with its strong educational links, educational software will be extremely important for the Electron and even now O and A Level revision papers are being processed for Electron users.




How to get your Electron.

The Acorn Electron can be found at local Acorn dealers and major high street stores. However, if you would like to order one with your credit card, or if you would like the address of your nearest supplier, just phone 01-200 0200.

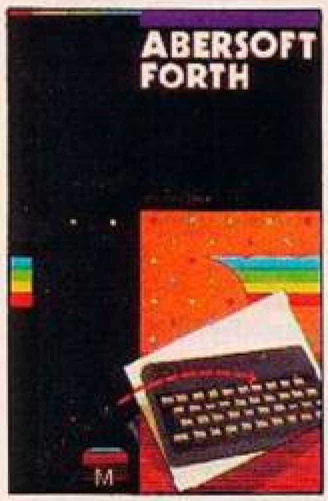


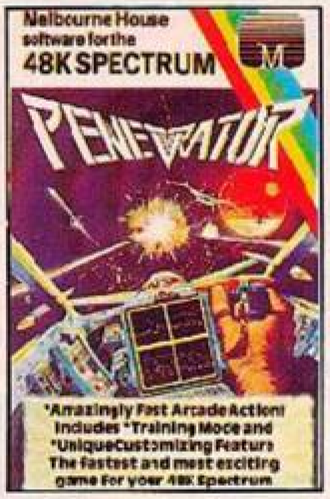

Technical Specifications

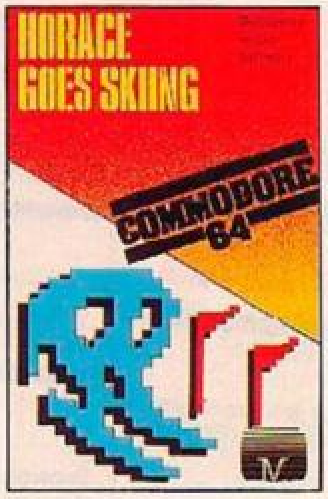
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Software.
BBC BASIC.
Extensions include interger, floating point and string variables, multi dimensional arrays: IF...THEN...ELSE, REPEAT...UNTIL, procedures with local variables.
Operating system allows plot, draw and fill commands.
Event timing.
Built-in assembler.
6502 assembly language can be mixed with BASIC.

The Acorn Electron.



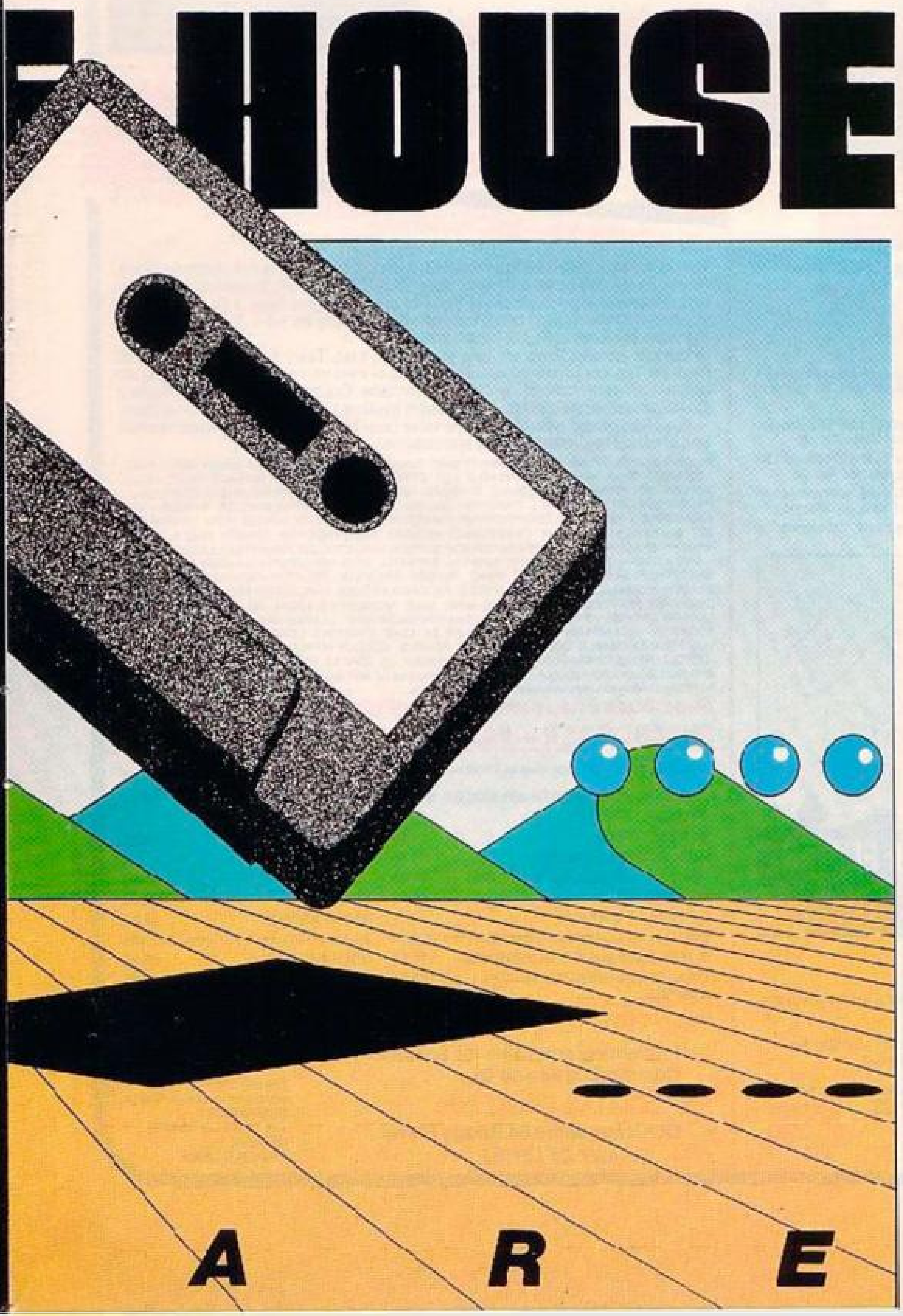




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All versions of 'The Hobbit' are identical with regard to the adventure program. Due to memory limitations, BBC cassette version does not include graphics.

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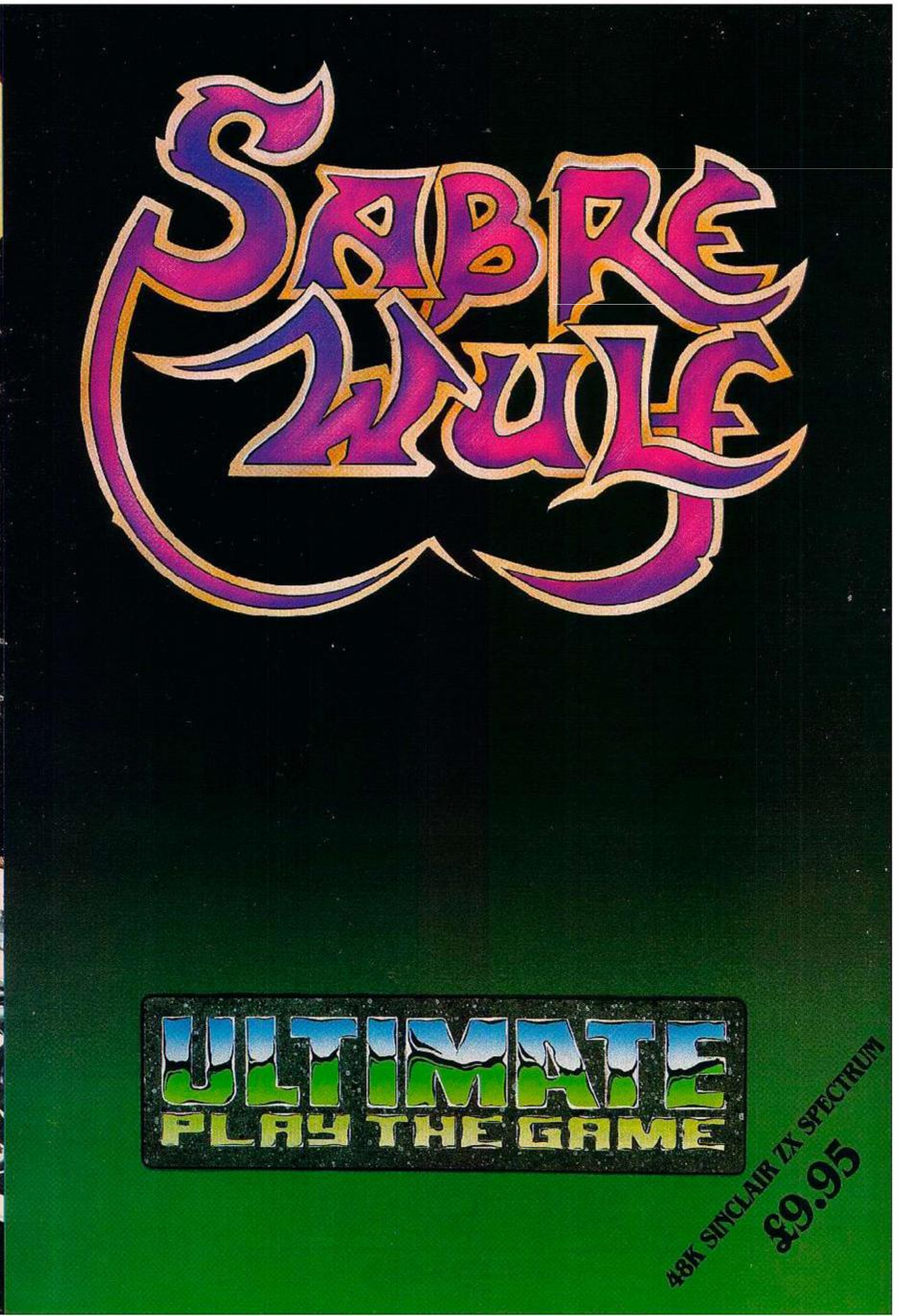
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# Sinclair ZX Microdrives and ZX Interface 1

# The affordable alternative to floppy discs...




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The unique ZX Microdrive system sets the ZX Spectrum apart from all other computer systems.

At a fraction of the cost of floppy discs, it gives fast access to 85K of program and data on Microdrive cartridges. And it opens up exciting possibilities through an RS232 interface and local area network.

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ZX Microdrives are controlled by ZX Interface 1.

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- Just 3.5 seconds to access a typical file.
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ZX Microdrives use the Spectrum's own power supply.

Your first Microdrive is connected to Interface 1 by a Microdrive lead. Then, up to 7 more Microdrives can be added using Microdrive connectors. That gives you a minimum of 680K bytes of on-line capacity.

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## ZX Interface 1 – the multi-purpose controller. £49.95

ZX Interface 1 is a multi-purpose device. It controls up to 8 Microdrives. And it adds file-handling and communication facilities to your Spectrum.

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- **RS232 interface** This industry standard interface allows you to link your Spectrum with full-size printers, communicate with other computers employing RS232, and transmit data over telephone lines via modems.
- **The ZX Net** Now you and your friends can transfer programs and data on a local area network – or even play computer games together.

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ZX Interface 1 offers you all these facilities, and retains the same peripheral port as the Spectrum itself.

*With each ZX Interface 1, you'll receive a connecting lead for the first Microdrive; a ZX Net lead with jack plugs; plus a comprehensive manual.*

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The best way to evaluate ZX Microdrives and Interface 1 is to see them for yourself.

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For more information, telephone Sinclair Research Ltd, on 0276 685311.



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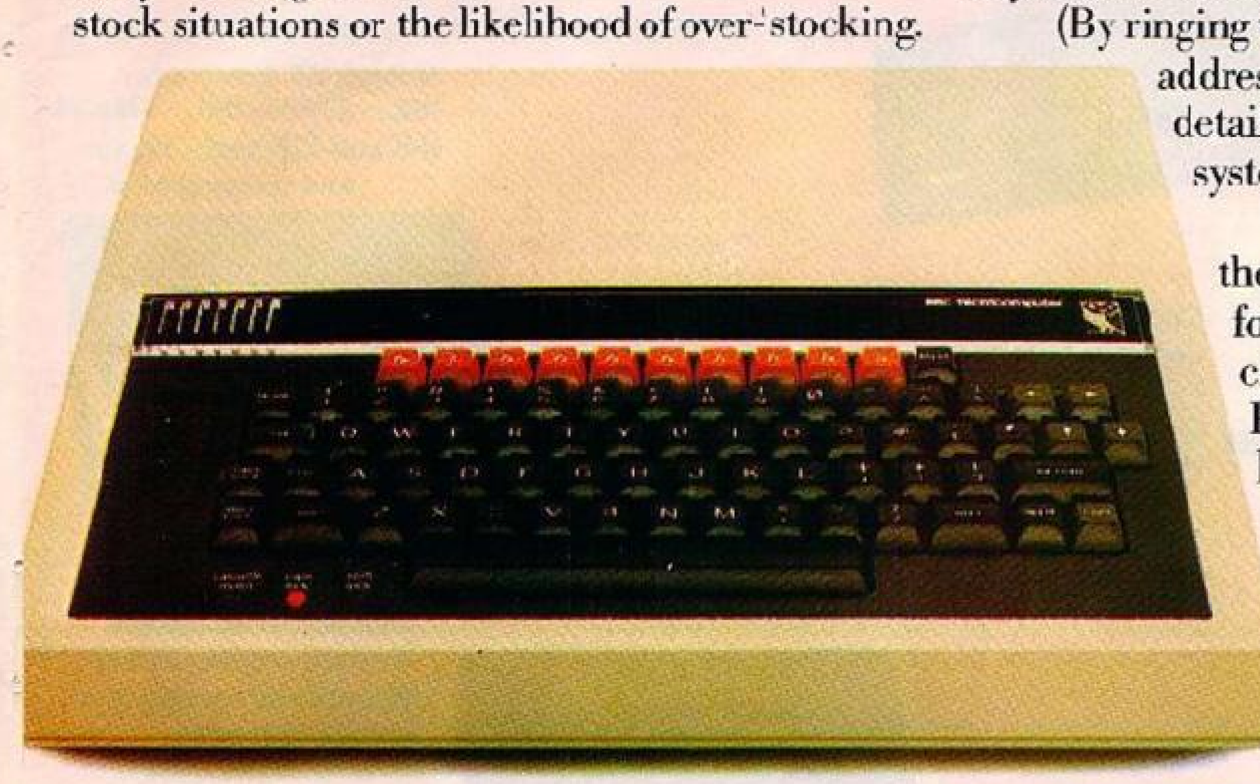
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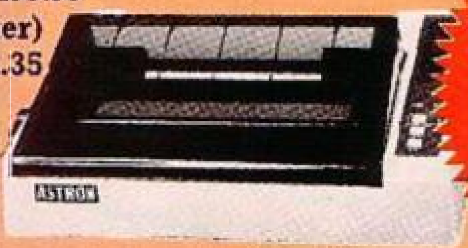
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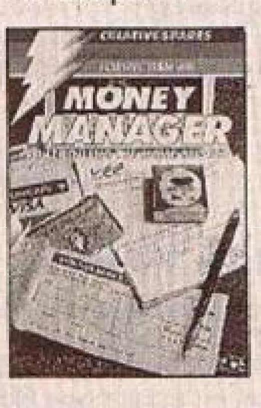
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All information can be saved on cassette tape. This means that you can update or examine the information held at any time.

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## HOW NOT TO SELL A COMPUTER

I would like to bring to your notice the attitude of certain computer dealers and their sales representatives towards younger people with an interest in computers.

This attitude is clearly illustrated in the following case which happened to me a few weeks ago. At that time my father had just decided to buy a personal computer with the specific application of word-processing in mind. My father, however, knows nothing about computers, and is also very busy, and asked me to do some research for him into the best computer he could get for his money. I acted accordingly, and narrowed the field down to three computers.

I eventually found a dealer who sold all three computers and 'phoned them up. I spoke to a very helpful man who fully realised my age and after a short discussion suggested that I came down to their showroom at some point that day for a demonstration. I was very pleased at this suggestion and went down to the showroom in Hammersmith later that afternoon. When my friend and I arrived we were greeted by a very fat, patronising man who told us that they did not stock all the computers they claimed to stock, we could not have a demonstration of the computers we were interested in, and could we please bring our "old man" down to the showroom; and then he would take, not us, but my father seriously.

Yet, earlier that day we had been told by a man working for the same people that we would be welcome to a demonstration, whether or not we were with my father. We had spent an hour and a half getting there and back, and had done absolutely nothing. What annoyed me most about this was that the dealer in question did not have a definite policy on whether or not to serve children, and accordingly missed out on making a sale of a £2000 computer. This seems to me to be a typical case of bad salesmanship in a country where there are so many young computer users. Dealers should judge their customers by knowledge rather than age.

*Dominic Young (15).*

## FASTER DRAGON

As you may know the Dragon has three speeds built in, but the fastest and most least used speed is of great value to utility and number crunching programs. Although the video chip is interfered with, the program still operates as normal but at a higher speed.

Everybody knows the Poke 65495,0 to speed up the program and Poke 65494,0 to slow it down again, and still use the screen as normal. With the exception of the cassette interface, more about that later.

To work at an ever faster speed with the loss of the screen you must place Poke 65497,0 in your program. It will not work any other way as you lose control of the computer if it is not running a program. Also I cannot stress the importance of the Poke 65496,0 when you wish to return to normal as if you do not you will have to Reset to regain control but your program will not be lost.

To show you some results I have used a stop watch to time these results for a loop of 10,000 and it would appear that the internal clock is not changed by the speeding up

```
A: normal speed time taken
  is 9.7 seconds
After POKE 65495,0 time is
  7.05 seconds
After POKE 65497,0 time is
  4.6 seconds
```

If you have ever used Poke 65495,0 before then you must, at one time, have saved a program at that speed and switched off without checking the program by SKIPF — as this does not New the program.

To reload a program saved this way type Poke 65497,0:CLOAD (Enter). The screen will go blank so you will have to watch the tape to see when it has finished loading and then either type Poke 65496,0 or reset and List. Your program should be alright but sometimes corruptions may take place as the cassette interface was not designed to operate at that speed.

Then be sure to re-Save your program to avoid another loss of hard work!

*Bruce Low,*
*Hanston,*
*Renfrewshire.*

## SAVING VU-FILE

My most useful program is Psion's Vu-File. I eagerly awaited the arrival of my Microdrive to speed up operations, but trying to save files on the Microdrive resulted in failure as Vu-File had overwritten the Microdrive channel. After several attempts I hit upon the following method of using Vu-File with the Microdrive, which means that existing files can be loaded from cassette and saved on Microdrive or cassette. Vu-File itself can also be saved and loaded from Microdrive.

Proceed as follows:

1) Load Vu-File from cassette as normal.
2) Break out of the program by selecting "Load a file from tape" and pressing Break when loading starts.
3) New the Basic, the machine code is safe beyond RAMtop.
4) Save the machine code on the Microdrive with the command
```
SAVE * "m" ; 1 ; "C" CODE
25083,5640
```
5) Enter a new shorter Basic program:
```
50 CLEAR 25087: LOAD * "m" ; 1;
"C" CODE DIM f$(32) LET a =
29785: GOTO USR 29721
1000 CLS:PRINT "SAVE FILE":
GOSUB 3000:GOTO USR a
1005 PRINT "ENTER SAVE
COMMAND g$ CODE s, 1 THEN
GOTO USR a":STOP
2000 CLS: PRINT "LOAD FILE":
GOSUB 6000:PRINT "ENTER
LOAD COMMAND g$ CODE s
THEN GOTO USR a":STOP
3000 LPRINT f$(TO 32):GOTO
USR a
6000 INPUT "FILE NAME",LINE
c$: LET f$(TO 10) = g$: LET s =
CODE f$(11) + 256 * CODE
f$(12): LET 1 = CODE f$(13) +
256 * CODE f$(14): RETURN
```
Do not alter the line numbers.
6) Save on Microdrive with:
```
SAVE * "m" ; 1 ;"VU-FILE" LINE
50
```

Vu-File can now be loaded from the Microdrive with the normal Load command. It will behave normally until a Load or Save situation occurs, then it will return to Basic. At this point enter an appropriate Load or Save command for cassette or Microdrive operation with g$ CODE etc as printed on the screen. When completed return to Vu-File by entering Goto USR a.

Not only does this method save the cost of buying another filing program, but it also means that all existing Vu-File files are compatible, and do not have to be re-entered.

*F.J.S. Lewis,*
*Abbots Langley,*
*Hertfordshire.*

## NON VIOLENCE

Play for Life is currently compiling a guide and it is intended to include a section on computer programs. Our primary concern is for playthings for the five to 12 year olds, but our interest extends to children of all ages. I would be most grateful if any software houses who feel they publish suitable programs would send me these.

The criterion for inclusion is that the programs should be constructive, creative entertainment. Thus we are looking for utilities that encourage the users to extend themselves, and their imaginations. Graphic and music utilities are excellent examples.

The sort of games that we're looking for may be harder to qualify, perhaps because there are so few of them? Alien zapping, dragon slaying games are definitely out! Dictatorial power simulations are similarly excluded. A lack of overt violence is no qualification, such games may still be aggressively competitive. So what are we looking for? Simulations that deepen understanding, role play games wherein the player helps others, arcade games that encourage co-ordination and swift reaction, but not if they depend on or include violence and aggression, and how about multi-player games that require the participants to work together?

We are greatly encouraged by the increasing media interest in Play for Life. Its first meeting in February received extremely sympathetic coverage on BBC Radio 4 and positive interest has been already shown by some of the quality press, not only in the Play for Life idea, but also specifically in appropriate computer software.

*Keith Ollett,*
*Computer Games Researcher,*
*Hookstead, Goldsmith Avenue,*
*Crowborough, East Sussex TN6 1RG.*
*Telephone (08926) 5832.*

## QL VALUE

I write with reference to Anthony Briggs' letter in your May issue concerning the Sinclair QL computer.

I totally agree with his point about Sinclair's poor customer service record, although I cannot say that I personally have had any cause for complaint.

I would also agree with his view of Sinclair hardware — I too find it a joy to work with. However, the fact that he can consciously reject Sinclair hardware in favour of the Japanese MSX computers amazes me, especially in light of the QL. In the same issue of your magazine we are told a few of the features of the QL that the advertisements don't reveal: definable character size, number range $10^{-615}$ to $10^{615}$, strings to length 32K, etc, etc. Show me an MSX computer which does all this for a better price and I'll eat my QL when it arrives!

With all due respect if Mr Briggs feels happier bashing Japanese plastic on a games-orientated machine, then who am I to say? When deciding what hardware I buy, I base my decision largely on getting value for money, and I consider paying £399 for a machine with features belonging to a £1000 machine an incredible bargain, even if I do have to wait three months for delivery.

*Kevin Ball,*
*Shepshed,*
*Leicestershire.*

## VIC THINGS

I feel I must write to complain about the misleading comments made in *Your Computer*, June 1984.

I am referring to the article on page 39 by Andrew Bacon entitled Things to do with your Vic.

In this article Andrew gives some interesting tips, programs and ideas. It is only the following comments that I wish to rectify.

☐ Graphic 4 does not exist. If it did it would be in the Super Expander manual. It is a repeat of Graphic 0 which resets the Vic, giving back the memory that a graphic mode uses up. The computer logically And's the parameter after Graphic with 3 to obtain a number in the range 0-3. Following this argument both Graphic 0 and Graphic 4 are valid and so can be used before a Graphic

command as well as after. I have done this and my Vic-20 doesn't crash.

☐Andrew says that to unplot a pixel on the Super Expander, a non-system word can be entered, preceding the colour register number.

Any computer fan will realise that a non-system word is a floating point variable name and thus what Andrew has done is to replace the colour register number with an undefined variable name, effectively a colour register number of zero. In the manual zero uses the screen colour. Making a pixel the same colour as the screen effectively unplots it.

Using his example:

CIRCLEOVER 2, 512, 512, 320, 460 is actually CIRCLE OV2 512, 512, 320, 460

Obviously if OV2 is 0 unplotting will result. If it is greater than 0, plotting will result according to the value of OV2.

☐Peek(650) — Location 650 may contain other numbers causing no keys to repeat. I may be wrong, but I believe the coding is:

0 = no keys repeat
64 = Cursor/Space Bar repeat
255 = all keys repeat

This leads me to suggest that the most significant bit affects all keys except Cursor/Space Bar ie:

128 bit set = keyboard keys repeat
64 bit set = Cursor/Space Bar repeat;

☐Peek(37159), Peek(36967). These locations do change the speed of the cursor but this is due to the fact that it represents the Hi Byte of Clock Generator 1 which generates the IRQ interrupt signal. I doubt very much that programs can run faster, only apparently slowed down.

☐Peek(36867). This location does not just change the length of the screen, but also effects the size of the characters. The selection of different size characters is done by the least significant bit.

If it is set then 8 by 16 characters result — not 16 by 8 as stated in the user guide. 16 by 8 would have been more useful. If it is not set, normal 8 by 8 characters are apparent. The normal value here is 46 which means 46/2 = 23 screen lines and normal 8 by 8 characters. Poking 36867 with 47 would give 8 by 16 size characters.

*Lee Borrell,*
*Audenshaw,*
*Manchester.*

## VIC PROTECTION

I have noticed that as far as program protection is concerned on the Vic-20 that we have been limited to disabling the Run-Stop key with a simple Poke.

However all this is about to change, with the aid of the following:

Disable List: If, for some reason, the program concerned caused an error it would be nice to prevent anyone from listing the program. There are two ways of doing this and they are as follows:

POKE 774,34:POKE 775,253

This will cause a warm start if List occurs.

POKE 774,116:POKE 775,196

This will give a syntax error if List occurs.

Disable Save: Now that your program is un-listable you must prevent it from being saved and then re-loaded later in order to gain a listing. Again there are two methods of doing this:

POKE 818,34:POKE 819,253

This will cause a warm start if Save occurs.

POKE 818,116:POKE 819,196

This will give a syntax error if Save occurs.

Disable Load: This will stop anyone loading a program which will re-set the above locations and enable them to copy your program. This is done as follows:

POKE 816,34:POKE 817,253

This will cause a warm start if Load occurs.

POKE 816,116:POKE 817,196

This will give a syntax error if Load occurs.

Disable Run-Stop: This is included for completeness and is done as follows:

POKE 808,127

*Kevin Willers,*
*Rotherham,*
*South Yorkshire.*

## CORRECTIONS

Listing 7 in July's BBC Sprites article contains an error. The second part of line 540 — starting with N5 — belongs instead to line 550 and should be tagged on to the end of the line after BC5.

## MSX — TOO LITTLE, TOO LATE?

I found your criticism of the MSX project — June Editorial — bang on target. With the arrival of home systems such as the Sinclair QL and the Advance 86A, I see only dark clouds gathering for anyone daring to launch a new eight bit micro, standard or not.

The MSX lobby also fail to take into account the following, which clearly shows their improvident approach to market domination.

A. The large number of present users who will upgrade to the more powerful systems now becoming available; which will cause an expansion in the second-hand market, of proved micros with software and add-ons a-plenty.

B. A price war between manufacturers, of presently produced eight bit micros.

C. The growing acceptance of the user-friendly concept, which by its very nature makes demands on memory that the eight bit is unable to comply with.

D. A first time user can learn equally as well on a 16-bit, running Basic.

E. Who wants to buy a "Model T" when a "Rolls Royce" is available for a few pounds more?

The MSX project can be summed up in four words, *too little, too late*. However, I believe UK consumers will welcome it as it will force home manufacturers to produce 16-bit systems. It would also be to the good if they adopt a 16-bit standard with the CPUs being produced here to prevent embarrassing component shortages of the type which occurred last year.

A future article from *Your Computer* would not come amiss addressing the following: Why are there so few powerful systems of the above type in the home users price range? What type of CPUs could be used? What type of advantage/disadvantages does a 16-bit offer in terms of software, useable RAM, graphics, sound and storage?

*B. Brecknock,*
*Nottingham.*

# How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

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## MAYFAIR MICROS

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# Computer Fair provides first public showing for Sinclair QL

DESPITE NERVOUSNESS throughout the home computer business caused by the financial problems affecting Camputers and Dragondata (see next page) and some slackening in demand for software, the Computer Fair at Earls Court got off to a resounding start on June 14 and was generally regarded as a successful exhibition.

Encouraged, no doubt, by the presence of Susan Hampshire, star of the new TV series *Leaving*, who opened the show, the Press were very much in evidence on the first day with no less than four TV camera crews in attendance. The results of their labours were seen on the Thames TV Database programme and the Channel 4 Earsay programme, among others.



*Susan Hampshire not only opened the Computer Fair at Earls Court but also visited the Sinclair stand where she helped promote the Dyslexia Beater cassette reviewed in last month's issue and found time to cast an appreciative eye over the QL computer.*

However, apart from Miss Hampshire, undoubted star of the show was the Sinclair QL appearing for the first time in public — and what is more without the add-on ROM which was the source of considerable comment when the early models were delivered.

Now, with the QDOS operating system comfortably accommodated within the casing of the machine and with the four applications packages for word processing, spreadsheet, database management and business graphics, all operational, the QL looks what it is — incredible value for money — a view which was certainly shared by the crowds who thronged the Sinclair stand.

Also attracting favourable comment were the new Commodore 16 and Plus/4 computers which were featured on the Commodore stand. The Plus/4 in particular, with four business programs included in the £249 price of the computer, was being viewed as a possible rival to the Sinclair QL, despite being based on a less powerful processor.

The tendency for home computers to move upmarket into business applications was also apparent on the Acorn stand. There the Z80 add-on processor for the BBC micro attached considerable attention. This enhancement for the BBC computer comes with its own 64K of RAM. Under the CP/M operating system some 55K of this is available for applications programs.

Putting a brave face on their financial problems were Dragondata who under the GEC Dragon marketing banner showed the extended range of Dragon hardware including the Dragon 64 complete with disc drives and the OS-9 operating system which transforms it into a versatile business system.

Also mounting a very professional presence at the Computer Fair were Oric whose Atmos computer is moving upmarket with the addition of a Hitachi disc drive and business-orientated database and spreadsheet software.

Perhaps a sign of developments to come, as European home computing markets begin to catch up with the UK, was the presence of No Man's Land, a French software company providing games software for a range of popular micros but with particular emphasis on the Oric 1/Atmos, now France's most popular home computer.

## SORRY

*We apologise to our readers and advertisers for late publication of this issue of Your Computer and for the omission of certain regular features. The cause is a dispute between the National Union of Journalists and Business Press International.*

## Oric looks to business

FOR £299 ORIC 1 and Atmos owners can now add a 3 inch disc drive. For £100 they can buy a modem to link up to Prestel, and for a further £250 they can round off their system with an 80 column dot matrix printer.

With these new peripherals Oric Products International claims the Oric has the makings of a viable small business system.

To highlight the Oric's business potential the company has included in the disc pack, database and spreadsheet programs as well as games software. These come together with the disc operating system and a Hitachi drive which uses double-sided, double-density discs to give a capacity of 320K.

The price of the modem also includes the 6K program necessary to convert the Oric or Atmos into a Prestel terminal and to enable them to download software.

Both these products are available now. The dot matrix printer will be released at the end of the summer.

## Machine code revealed

FOR THOSE wishing to learn machine code help is at hand in the form of a software package covering four leading micros — the 48K Spectrum, Commodore 64, 32K BBC micro and 32K Atari.

Entitled the Computer Machine Code Tutor, the package is available in two versions — one for the Spectrum which is based on the Z80 microprocessor and the other for the Commodore, BBC and Atari computers all of which are based on the 6502 microprocessor.

Each version of the Tutor comprises two cassettes which load the tutor and then take the user through a series of lessons and exercises. The Spectrum version, which contains over 100K of data on the two cassettes, includes 33 separate lessons, while the 6502 version contains 70K of data and includes 27 lessons.

A simulator routine takes the user through all aspects of the Tutor to give a thorough understanding before starting the lessons.

Both versions come with manuals explaining the instruction codes of the Z80 and 6502 processors respectively. Prices at £14.95, the Tutor has been introduced by New Generation Software.

## Joysticks on show

TWO PRODUCTS launched at the Computer Fair by Kempston Micro Electronics were the Pro Joystick Interface for the Sinclair Spectrum and the BBC Pro Joystick.

The main features of the new Spectrum joystick interface are three 9-way D plugs allowing any of the Competition Pro range or standard Atari type joysticks to be connected. Two of these plugs allow compatibility with Sinclair/Psion software (ie simulate keys 1 to 5 and 6 to 0) while the third offers the dual facility of both Kempston Joystick software and Cursor key software.

A further feature is the built in cartridge slot which allows the use of ROM-based software.

The Interface simply plugs into the expansion port of the Spectrum; additionally it can be used in conjunction with ZX Interface 1 and microdrives.

The BBC Pro Joystick is based on the Competition Pro 5000 series which so far has been available only in standard Atari-type format.

The BBC version contains micro switches allowing movement in eight directions together with twin fire buttons for right and left-handed play. The joystick plugs into the analogue port on the BBC and is compatible with a wide range of software.

Prices of the new Kempston products are £19.95 for the Pro Joystick Interface and £16.95 for the BBC Pro Joystick.

## Game Lords go for gold

NO DOUBT to keep themselves in appropriately lordly style the Game Lords aka Quicksilva have sold out to the Argus Press Group, publishers of Computing Today and Home Computer Weekly.

Quicksilva will continue to operate from its present location in Southampton and director, Mark Eyles says that the company will continue to trade under its own name as an independent member of the Argus Group.

The take-over by Argus has provided Quicksilva with finance for further development one of the first fruits of which is the formation of QED — Quicksilva Edutainment Dimension — (Sorry about the name) a new division which aims to produce games "with a serious educational content, but presented in a 'fun' way". QED games for Sinclair, Commodore, Atari, Acorn MSX and Enterprise micros are in the pipeline, scheduled for an Autumn launch.

An indication of the way in which the software business is developing is Quicksilva's conclusion of a licensing deal with Atari. First fruits of this deal will be the conversion of the arcade game Battlezone for the Spectrum. Its origins will be clearly credited and rather than ripping off other people's ideas Rod Cousens, managing director of Quicksilva hopes that the agreement with Atari "may establish a trend in seeking licensing approvals in the promotion of authorised versions for . . . home computers".

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# Micro Mouse contest Dibley does it again

THE MICRO MOUSE contest is now an established feature of the Computer Fair and the sight of microprocessor-based mice threading their way more or less purposefully to the centre of a maze is familiar to those with a contemplative side to their nature.

Like coarse fishing, watching micro mice pottering around a maze is not for those with a taste for action.

On the side lines things are different. Mouse builders who have toiled over their electronic marvels during the long winter evenings go quietly bananas as their mice turn in the wrong direction, lose their memory maps or refuse to budge at all.

At this year's British micro-mouse final held at the Earls Court Computer Fair Alan Dibley, doyen of mouse builders, experienced just such a blow when T5, the latest of his stable of mice, having performed well was improved to death by a misplaced screwdriver.

It seemed that the honour of the Dibley team rested on Thezeus, a grizzled veteran from the pre-history of mouse building who plodded resolutely to the centre of the maze in 9 minutes 48 seconds. Hardly a winning time. However, help was at hand in the form of T4 a more recent Dibley development which after one or two false starts zoomed to the centre in 15 seconds.

It was too much (or too little) for Dave Woodfield, Britain's other main mouse builder. His pride and joy, Thumper, having put up a fantastic qualifying time during the morning nosed in a desultory fashion around nosed in a desolutory fashion around the first few metres of maze before quietly giving up. It seems that its batteries were flat.

All depended on Woodfield's other mouse Known Aim, a skeletal creature with the look of a purposeful stick insect. But despite some fast times Known Aim was handled by his maker incurring penalty points which left Dibley's T4 as the outright winner. Alan Dibley thus represents Britain in the Euro-mouse Maze Contest to be held at the Euromicro Conference in Copenhagen.

As winner of the British heats at the Computer Fair, Alan Dibley received an Oric Atmos computer, membership of the Oric Owners Club and a cheque covering his fare to Copenhagen, all of which were generously donated by Oric Products.

The winner in the Novices category of the micro-mouse contest was Bill Urmenyi who is now the proud owner of an Acorn Electron donated by Acorn Computers.

The runners up in both Expert and Novice categories received cheques for £50 from the publishers of *Your Computer* who are also sponsors of the Computer Fair, and those who came third received £30 worth of books donated by Sunshine Publications.



Dave Peachey of Oric in interviewing mode at the Computer Fair: "What's it feel like to win the Micro Mouse competition, Alan?" "I'm over the moon, Dave" which is understandable because Alan Dibley had just won an Oric Atmos computer and membership of the Oric Owners Club together with his fare to Copenhagen where he will represent Britain in the Euromouse finals. The first prize was generously donated by Oric Products.

## Quick load routine

RELIEF IS at hand for CBM owners who are tired of waiting an age for cassettes to load in. Software companies are now starting to accompany tapes for the Commodore 64 with a quick load routine which loads in programs up to eight times faster than normal.

The routine precedes the game on tape and works by altering the machine's cassette operating system. Using this technique Thorn-Emi's Turbo Tapes load in a 16K program in under a minute. The company is also offering the same facility on some of its Vic-20 games.



*Getting the best of both worlds. The Commodore Plus/4 computer is intended to appeal to home and business users alike. Leaving you to work out which this characteristic picture of Snoopy represents, we would only add that at £249 it seems good value — even if its not exactly peanuts.*

## 16 Plus 4 = 2 new micros

COMMODORE HAS launched two new computers, the 16 and the Plus/4, to sell alongside the Vic-20 and the CBM 64.

Despite the fact that the 16 appears to offer a higher specification for the same price, the company maintains that it will not replace the Vic. Commodore's software manager, Gail Wellington, said that as long as there is a demand for the Vic they will continue to manufacture it.

Both machines contain 32K ROM which includes a new Basic interpreter. Basic 3.5 improves on Commodore's existing version of the language by supplying graphics and sound commands.

They also share the same text and graphics resolution — 40 rows by 25 columns together with 320 by 200 pixels. 15 colours are provided and each can be set to one of eight levels of luminance.

Sound is catered for by two tone generators, one of which can be used to produce white noise.

The two machines are based around Commodore's 7501 chip. This combines the 6509 processor — a version of the 6502 — with the Vic display chip. For machine code programmers there is a built-in Monitor with 12 commands.

The Commodore 16 will sell for £129.99 in a starter pack comprising the computer, a cassette unit, Introduction to Basic Part 1 and four games tapes. It offers 16K RAM and 12K is available to the user.

The Commodore Plus/4 costs £249 and is intended to appeal to home and business users alike. It comes with 64K RAM and four QL-style software packages, a spreadsheet, a wordprocessor, a database and a business graphics program.

Unlike on the QL these four programs are stored in a further 32K ROM, and are available at the touch of a function key. Each can exchange information with the others, while a screen window facility allows the user to view two packages at the same time.

## YOUR COMPUTER TOP 20

| Game | Company | Machine |
|---|---|---|
| Atic Atac | Ultimate | Spectrum |
| Avator | Acornsoft | BBC |
| Black Hawk | Thorn EMI | CBM 64 |
| Blagger | Alligata | CBM 64 |
| Blue Thunder | Foundry Systems | Spectrum |
| Chariot Race | Micro Antics | Vic-20 |
| Chequered Flag | Psion | Spectrum |
| Duck Shoot | Master-tronics | Vic-20 |
| Fighter Pilot | Digital Integration | Spectrum |
| Forbidden Forest | Cosmi | CBM 64 |
| Fred | Quicksilva | Spectrum |
| Hunchback | Ocean | Spectrum |
| Jet Set Willy | Software Projects | Spectrum |
| Kriegspiel | Beyond | Dragon |
| Manic Miner | Software Projects | CBM 64 |
| Orc Attack | Atari | Atari |
| Percy Penguin | Superior Software | BBC |
| Tank Commander | Thorn EMI | Vic-20 |
| Trashman | New Generation | Spectrum |
| Zaxxon | Starzone Software | Spectrum |

## Double trouble

THE NEWS THAT two home computer manufacturers — Camputers and Dragondata — have experienced severe financial difficulties has sent a tremor through the micro business.

Camputers, manufacturers of the Lynx home computer and the recently announced Laureate business system has been looking for additional sources of finance for some time and it now appears that it has reached the end of the road with liquidation as the most likely outcome.

In the case of Dragondata the situation appears slightly more hopeful. Having gone into voluntary receivership a buyer for the whole company is being sought. At present Dragondata has a marketing agreement with GEC which is continuing pending the possible emergence of a new owner to carry on the business.

Paradoxically, news of the problems encountered by these companies comes after a very buoyant period in the home computing market. Figures released by AGB Home Audit, a market research company, reveal that home computer sales in the UK rose by 75 per cent in the first quarter of 1984 compared with 1983. This represents sales of 200,000 home computers in the first quarter of the current year as against 114,000 for the same period last year.

# BEGINNERS first bytes

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

## I could do that...

This month's problem is an old favourite. Write a program to print out all the prime numbers below 1000. There are a number of ways of tackling this problem. We are looking for the program that does the job in the fastest time. In awarding the £15 prize we will make allowances for speed differences between Basics.

*"I've been using a computer for some time now, and I know Basic pretty well. Now I want to start programming in machine-code, but the trouble is that I don't know where to start. I wonder if you could help me?"*

## Getting started on machine code

BEFORE YOU CAN start writing machine-code programs you have to find out which machine language — machine-code — your computer uses. This depends on the processor inside, and so the first thing to find out is which processor you've got.

There are many microprocessors, but only a handful of these are used as the heart of home computers. The most common one is probably the Z-80, as it is this that makes the Spectrum tick as well as the Lynx and many other more expensive computers. The next most widely used is the 6502, used in the BBC, Electron, Apple and all the Atari home computers. A modified version of it is the 6510, used in the Commodore 64. Other processors in home computers include Texas Instruments' TI9908 — used in the TI99/4A — and Motorola's 6809 — used in Dragons — and 68008 — used in the new, low profile, QLs.

So, before you go any further, find out what processor you are using — this will tell you what machine language to learn.

Unfortunately it isn't quite as simple as finding out the processor you've got and then learning the language to fit it. An awful lot depends on how the memory of the computer is arranged and accessed by the chip, and also on the special facilities your micro has got.

These might include dedicated processors to look after the graphics or sound — the 64 has both, in the 6566/9 video chip and the dedicated 6581 SID chip — sound interface device — or unusual ways of accessing memory, particularly if there is more memory than can be seen in one go by the chip.

So, the next step is to find out how the memory of your micro is arranged. This is best seen with a memory map, which is a schematic picture of what the memory looks like. There is usually some kind of map in the user manual, though the best ones are often to be found in the technical manuals or books about your micro.

The best memory maps tell you not only what the memory looks like, but how the processor uses it too. They should list what the specific locations in memory do, or at least those that are important. It is particularly useful for example to be able to know where the start of the Basic program is, or where a pointer to it can be found, as well as knowing where the colours are stored or what their values are.

A good memory map can also be very helpful to your Basic programming, as you can then use efficient Pokes to put variables or numbers exactly where you want them. You can also use the information to help you protect your programs from theft by hiding pointers and replacing them later.

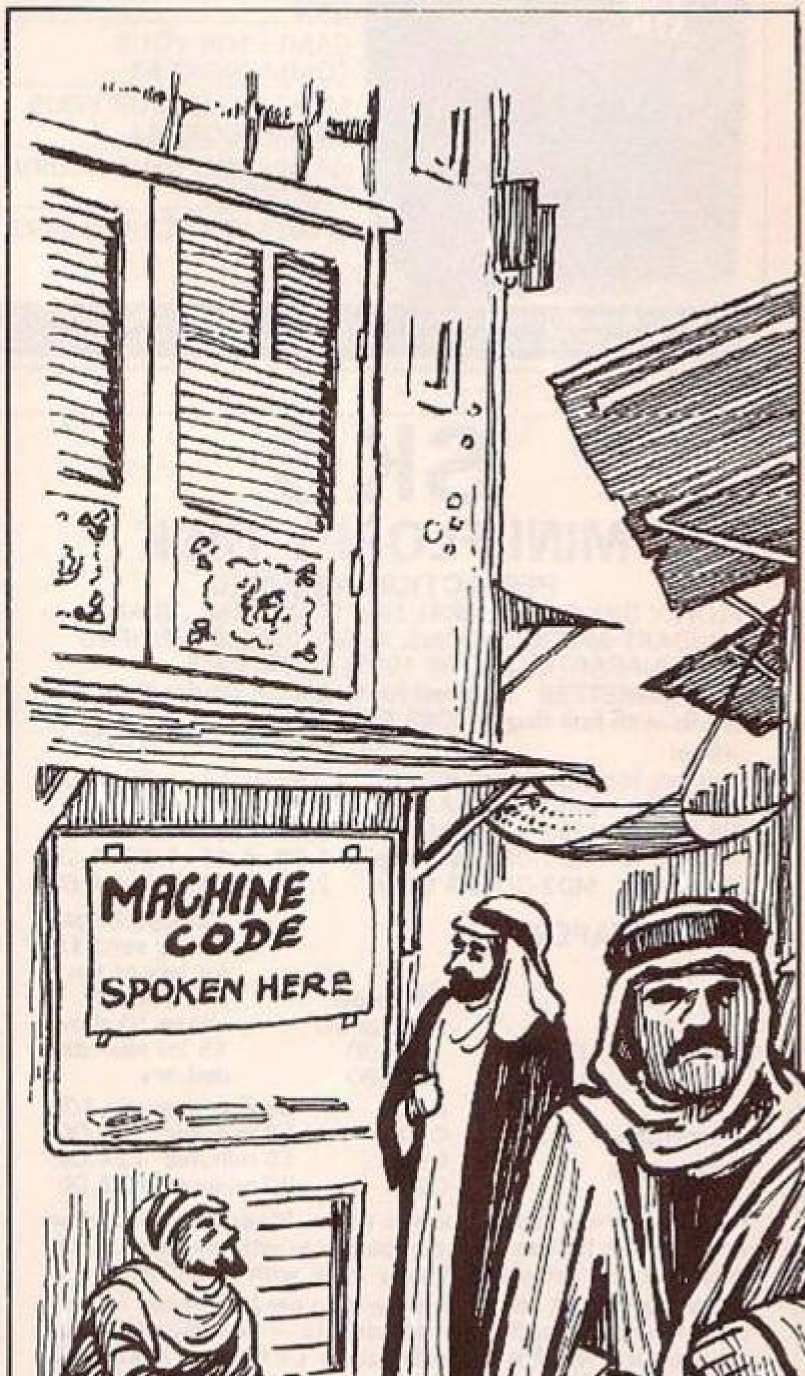
Sadly, even if you have a complete memory map and you know the machine language that you want to use, you are still a long way from knowing how to program your micro in machine-code.

The main obstacle facing you now is that of getting the machine-code into the machine. The ease with which you can do this is entirely dependant on the micro you are using. The most helpful ones, like the BBC, have been designed to allow you to do this very simply, even to the extent of being able to write machine code programs from within Basic.

Micros like the BBC have a built in assembler. What an assembler does can be understood best by looking at what happens to any program that you type in in Basic.

What happens is that as you type it in it gets stored in the computer's memory, and when you come to type Run the processor looks at each instruction and interprets it. With machine-code programs it is slightly different — when running these the processor looks at the individual bytes, and so individual bytes or

(continued on page 41)



(continued from page 39)

pairs of bytes are what you have to put into the memory.

Without any software assistance you can simply Poke the information into memory, but this does require you to be working at bit level. On some machines — notably the Spectrum — this is not too difficult, once you get used to it, but compared to writing Basic programs it is very slow.

An assembler allows you to use semi-helpful words as instructions — mnemonics — although you are still working at byte level. For example the instruction

LDA,8

The machine-code instruction above would be turned by an assembler into two bytes, the first of which would contain an instruction to load the second byte (8) into the register A. In true machine-code this would be just 16 bits, or one hexadecimal number — as you can see it is much easier to use an assembler.

Most assemblers are simply a piece of translation software, and can take a lot of getting used to — it is best to buy carefully here, though if you have a BBC you can use the built in assembler.

So, to start using machine-code you need to know which processor your machine uses, all about the memory of your micro, and either the pure machine language or an assembler for it. This takes time, but the results, as you've probably seen from the best games around, can be superb. It is worth the effort, but be prepared for a struggle.

Getting machine-code programs typed in is only about half of the battle. As you know from Basic programs debugging takes up nearly as much time as programming. But how can you debug single bits, which is usually where the mistakes are? One way is to Peek the locations, and check the results with what you expected.

A software tool that helps you do this is the machine-code monitor, which lets you look at the memory, and if it's a good one, it also lets you trace through your programs step by step, and lock at or change the registers at the same time.

If you are serious about getting into machine-code then I would recommend that you get a book specifically for this purpose, and for your machine. Books on machine code are usually a lot more helpful than the manuals, and are worth the investment — after all most of them are no more expensive than a piece of software.

# BEGINNERS first bytes

# Choosing a printer

A PRINTER IS the first big purchase a new computer owner is likely to consider. Large numbers of all kinds of printers are being bought by home computer users, and the combination of competition and high sales has brought prices down over the past few years.

More people than ever before can now seriously think about buying a printer. This is marvellous, but the variety of the choice does bring confusion. Instead of being limited to the little — lamented, or little-lamented? — Sinclair ZX printer, Spectrum owners can now hook up thermal, multiple pen, dot matrix, daisywheel, or combined typewriter/printers to their machines.

What are the pros and cons of the various types? Which will best suit me? What are the questions I need to ask myself to reach a sensible conclusion? First, a summary of the differences between the types of printers.

1. Thermal printers: The Sinclair ZX printer works by using a spark to burn through the aluminium film on the special paper rolls. Other makes use a special heat-sensitive paper. The ZX printer can be used on many other popular micros using adaptors costing below £30.

If you want program listings and screen dumps, and already have a ZX printer, you could use it with one of these adaptors on your new micro. While this printer could not be described as reliable by the most loyal Sinclair user, Alphacom thermal printers give a much better print quality, and they are reliable.

The Alphacom 32 is made for Sinclair machines — with adaptors to hang it on to other machines — and the Alphacom 42 is available for most popular micros. They give either blue or black print on 11cm wide paper. Printing speed is also appreciably better than the ZX. A new 80 column version is coming.

2. Dot matrix printers: Pins hit an inked ribbon making patterns of dots on plain paper. Normal text is printed very fast, and programs are available for most micro/printer combinations to print copies of screen displays — but slowly!

For many purposes, they are ideal. Program lists, work-sheets for teachers, letters, draft articles for computer magazines, the list of application is huge — that is why this group of printers dominates the market.

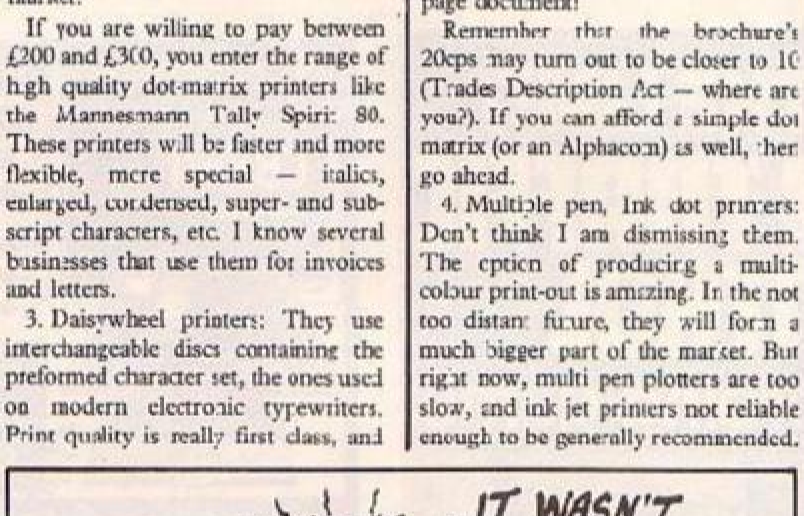
If you are willing to pay between £200 and £300, you enter the range of high quality dot-matrix printers like the Mannesmann Tally Spirit 80. These printers will be faster and more flexible, more special — italics, enlarged, condensed, super- and subscript characters, etc. I know several businesses that use them for invoices and letters.

3. Daisywheel printers: They use interchangeable discs containing the preformed character set, the ones used on modern electronic typewriters. Print quality is really first class, and by changing the wheels you can switch between three sizes of print, and between character types, in the same document.

But printing speed is slow. Falling prices bring the Juki and Daisystep machines within the reach of many home micro users. However, think hard before buying one. Do you really need that quality? In the shop the printing speed may seem alright, but wait until you need to list a big program, or print the draft of a four-page document!

Remember that the brochure's 20cps may turn out to be closer to 10 (Trades Description Act — where are you?). If you can afford a simple dot matrix (or an Alphacom) as well, then go ahead.

4. Multiple pen, Ink dot printers: Don't think I am dismissing them. The option of producing a multi-colour print-out is amazing. In the not too distant future, they will form a much bigger part of the market. But right now, multi pen plotters are too slow, and ink jet printers not reliable enough to be generally recommended.




5. Combined typewriter/computer printers: At first sight, these seem to be an obvious choice. A real electronic typewriter, doubling up as a printer for your listings. Marvellous! Or is it? The slow speed makes it a very poor choice for listing programs, and bashing out rough drafts.

Also, if you have a reasonable word processing program for your micro, you will find it hard to go back to an ordinary typewriter, and you could have bought a white elephant. Of course, there are circumstances when this option will make very good sense. Does someone else in your home really need a typewriter?

You would sometimes appreciate the superb print quality of a daisywheel. The extra cost of the interface will then be money well spent.

- Under £100. You will find it hard to beat the Alphacoms for a balance of price and quality, with a good printing speed.
- £100-£200. There is a gap here. The new 80 column Alphacom or the Brother HR5 may fill it. There are lower price dots in this range, but think hard about the benefits of those in the next group. Will it be worth waiting until you have saved the extra cost?
- £200-£350. You will find here some good quality printers, like the Epson RX80 and the Mannesmann Tally Spring 80, giving flexibility and high printing speed. The Daisystep daisywheel is in this range, if you can tolerate the slow printing speed.
- £350 and upwards. In this range you begin to meet printers designed to flourish in the 9 to 5, five days a week, week in, week out world of commerce. Are you sure you need this rugged construction? But then, most people don't need Quads, Nikons or Porsches — they're not essential, but very nice if you can afford them!

Whatever choice you make, even if it's only the little ZX wonder, this is certain: Once you plug a printer on to your micro, your computing enters a wonderful new dimension, and you'll wonder how you managed before you bought it.

If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

## Local news

### Tamworth

Taking its name from the Tamworth Voluntary Activities Centre, Ludgate Street, Tamworth, Staffordshire, the Tame Computer Club meets on the first and third Friday of each month. All types of machine from home-made to professional business systems are welcome. For further details contact Tony Beckett on Tamworth 53473 or Alan Wiseman on Tamworth 69537 — after 7.00 pm.

### Walsall

Every second and fourth Monday of the month — the Walsall Computer Club meets at Park Hall Community School, Park Hall Road, Walsall, Staffordshire. For more details contact Walsall 23875.

### Wolverhampton

Despite being called the West Midland Sinclair Users Group, people with CBM-64s or Aces are welcome to the weekly meetings at Ounsdale School, Wombourne, near Wolverhampton. For more details contact Graham Walden, WMSUG, 80 Planks Lane, Wombourne, West Midlands.

### Coventry

The Coventry & Warwickshire Commodore Computer Club is one of the Midlands' most lively user groups. It meets on the fourth Wednesday of each month except August and December at Stoke Park School and Community College, Dane Road, Coventry. For more details phone regional ICPUG on 0203-413511.

# COMPUTER club

**Paul Bond discovers a novel idea to help kids get hands-on experience of micros — the Hammersmith and Fulham Playbus Scheme.**



THE HAMMERSMITH and Fulham Playbus Scheme may not sound like a computer club to you — and to some extent you would be right. But as part of its important function of making various recreational and educational resources available to a community that might not otherwise even get to know about them, let alone use them, the project has started carting computers round to various youth centres in order that kids get some hands-on experience.

But don't they have this sort of thing in schools? Ian Miller, whose brainchild this is, maintains not — at least not with the Sinclair ZX Spectrums which are the group's staple micro at the moment.

"There are very few ZX Spectrums in London schools, or BBCs for that matter," he says. "The problem is not grants, particularly, but that Inner London Education Authority maintenance people will only deal with Research Machines." Teachers new to micros are shy of taking on something without ILEA backing, it would seem. Nevertheless, ILEA did cough up enough to buy two of the group's four Spectrums.

"We chose this machine because it was the best thing around at the time. We wanted to prove it could withstand rough treatment — being shoved in vans and moved from place to place, plus being pounded by kids."

But before you can teach the children, you have to teach the teachers, so Ian Miller is taking his micros round to various youth centres and playschemes: first, to see who they are accepted, and secondly, to create enough knowhow in the playleaders so they can oversee computer activities on their own.

Derrick Wauchope has been a playleader "for years and years" — he started when at school and has been doing it full-time for four years. Grappling with a game of Voice Chess — using the Currah speech synthesiser — was less of a problem for him, though, both because he is a keen chess player and because he studied business computing while at college.

Wendy Copeland — a playleader for eight years — was a little less successful with her first stab at the Hobbit adventure game, completing 2.5 per cent and being devoured by a hideous troll. Such are the hazards of community work.

Peggy, who very quickly became *au fait* with hooking and unhooking all the various computer leads, pointed out that Coningham Road was more than just an adventure playground: "It's a craft centre." Activities include everything from sculpture to horseriding — in Finsbury Park. They try and organise three or four holidays a year for the children, together with day-trips and outings to sports events. There is a lot of interest in musical activities "but it's all sound systems and electronic instruments. Teaching guitar is pretty dated".



At one youth centre, the Playbus organiser had already had a great deal of success in getting kids who were already computer-orientated to do more in the way of graphics and speech synthesis programming. He was also working on ways of using the TasWord system to give unemployed people some experience of word processing. "I could really do with some contact and help from local computer clubs, though. There don't really seem to be any in West London. I was approached by a group of community workers who wanted to know how to use a Commodore for office work. I'm snowed under with these kinds of requests for help."

Future aims include specific projects like working on graphics programming and using Logo — hopefully with a real Turtle. "Logo is useful for learning about graphics and programming by the back door, without realising that they're doing it. It's good for handicapped kids — teaches the about direction and length and space." Hammersmith and Fulham Playbus Association can be contacted at Project Enterprise, 16 Askew Crescent, London W12 9DP. Telephone 01-740 7271.

# DON'T JUST SIT THERE - PLAY SOMETHING!

## FORBIDDEN FOREST

Forbidden Forest is more of a quest than just a game! The action takes place in a four dimensional scrolling forest landscape which many have entered, but none has returned. Yes, I did say FOUR dimensional: day fades into night as the action unfolds! The quest is to seek out and destroy the Demogorgon, mystic ruler of the Forbidden Forest. Before you can even set eyes on him you will have to contend with his army of fearsome creatures, including mutant spiders, showers of giant frogs, snakes, dragons, skeleton soldiers and more! You have only your trusty bow and arrows to depend on!



**SS018**



## AZTEC CHALLENGE

A challenge on an epic scale! Aztec Challenge takes you on a journey to Mexico and the ancient pyramid of Tenochtitlan. The ancient Aztec gods and their devotees have ensured that no ordinary human can learn the secrets of the temple and live to tell the tale. The pyramid is protected by all manner of treacherous traps and hidden perils - an epic test of your courage and cunning. Aztec Challenge features no less than seven totally different screens - here are just three of them - each of which presents a brand new challenge. We hope your joystick can stand up to it!

**SS019**

## SLINKY

Slinky, the spring, was having fun hopping about when suddenly he came upon a pile of coloured blocks, so he thought he'd play around on them for a while. Much to his amazement he found that they changed colour when he landed on them. Wow! But unknown to him, the blocks belonged to the Wicked Wizard, who sent his friends along to tease our poor hero. Slinky is a real fun package with ninety-nine levels, amazing reward displays, and action replays. Where else could you meet such charming characters as Dusty the dust cloud, Marge the magnet, Ralph the random raindrop, and Lorenzo the chameleon hopper?



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# SOFTWARE *Shortlist*

## Star★ chart

### Tank Commander

*Vic-20 + 8K*
*Strategic Action*
*£5.95*
*Creative Sparks*

★ ★ ★

Puts you in the driving seat of a tank. Screen display shows an overhead view of your manoeuvres as you drive into enemy territory and blow up the enemy fuel dumps. Under continual attack from tanks and aircraft, each round is of increasing difficulty. It's like Eastern Front insofar as the terrain scrolls, but it's a lot less intellectual. So if you must drive around shooting at things, why not play this game instead?

### Red Meanies

*Dragon 32*
*Eat-'em up*
*£6.50*
*Salamander*

★ ★ ★

A kind of three-dimensional Pac-Man with cheese instead of power pills. If you eat any green cheese as you perambulate around the maze, this turns the red meanies blue and renders them edible. Strangely enough, they tend to jump down your throat in this state; meanwhile another red meanie is released into the maze. Useful display shows how many meanies and lives are left. Nice idea, shame about the graphics.

### Stock Car

*BBC B*
*Car race*
*£7.50*
*Micro Power Ltd*

★ ★ ★ ★

I have been waiting for the ultimate car race — this is near to it. A one or two player game which requires a certain amount of learning and skill leaving the player weary and hot! A tip: if you have BBC joysticks, use the keyboard!

## Encounter

☐ *CBM-64*
☐ *£7.50*

★ ★ ★

Out for a spin in the old laser tank you cruise through an alien landscape in which the green grass and blue sky are interrupted by a network of tall black cylindrical structures which look like the sort of architecture that Prince Charles would probably complain about.

Sooner or later the locals turn out to cause trouble but, unlike housing estates, here they do not have Harringtons and crewcuts, rather they bear a strong resemblance to flying saucers.

Encounter is similar to games of the 3-D tanks genre, except that your assailants are not armoured vehicles with tracks. Sensation of speed and manoeuvrability as you charge through the maze of mysterious black cylinders is very strong. At the bottom right-hand side of the screen is a display giving a plan view of hostile forces around you.

Using the joystick you swivel around until you have visual contact with one of the blighters, usually a small blob skimming over the plain near the distant mountains.

They zoom towards you and will cause you a certain amount of damage if you fail to destroy them before they hit you; they start shooting at you. If you do hit them



they disintegrate in a haze of triangles. Homing missiles appear periodically: the warning panel flashes red and the best tactic is to reverse away from them while firing. They never miss unless destroyed. Try not to back into a pillar.

Once you have eradicated all the malcontents from the forest of cylinders you are catapulted through a star gate. Space is cluttered up with rocks as usual; dodge these and you arrive at a new scenario, which is basically the first one in different colours.

Little touches like the warning siren that goes off as the homing missiles approach add a new dimension of interest to this game. I found it addictive; a pity that the scenery is so boring. An unusual place to visit, but I wouldn't want to live there.

## Carnival Massacre

☐ *Atari*
☐ *£15.00*
☐ *Creative Sparks*

★ ★ ★

"Fun turns to fear" proclaims the Friday the 13th style cover which shows a couple of disturbed adolescents hurtling off a fairground switchback. Butcher Bill and Ruthless Rick are out to turn all the cries of pleasure to cries of blood-curdling terror, we are told. Slipping quickly into Mary Whitehouse mode, I get ready to lay waste yet another evil threat to the tender minds of the nation's youth.

In fact, it is all pretty twee. "When you are in love, it's the most wonderful night of the year" burbles away relentlessly in the background as the pretty fairground Ferris wheels spin on-screen. Every so often someone falls off and you have to catch them. Bill specialises in missiles on the wheels while Rick plants bombs on the roller coaster. When you have saved everybody you grab your gun and shoot the egregious pair as they cruise overhead in the sky-lift.

This is a game that plays on the




frustration side of your reflexes, rather than the aggression. It's much harder to save things than it is to blast away at them. But you can work all that tension off when you consign Rick and Bill to oblivion. You have to have saved at least six passengers to be able to do this.

A gun appears at the side of the screen — fetch this and an egg-timer appears to register how much time is left for you to gain bonus points for shooting Bill down from the Ferris wheel. The same applies to toppling Rick from the roller coaster. Attractive graphics and not as grisly as it is painted on the cartridge cover.

## Bath Time

☐ *CBM-64*
☐ *£7.95*
☐ *PSS*

★ ★ ★

Bath Time is part of a new wave of "wet" computer games designed to clean up the software market, rather than just clean up money. Along with Dinky-Doo and the Snowman, they form part of a thoroughly soppy development in computer games, which the staff of *Your Computer*, thoroughbred pacifists and bath-takers to a person, can only applaud.

*(continued on page 47)*

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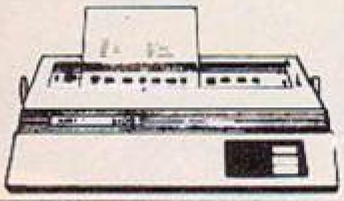
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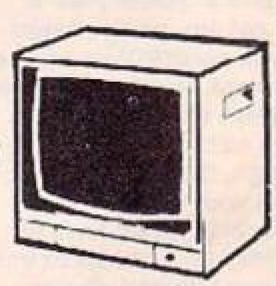


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# Star★chart

## Frenzy

*BBC B*
*Novelty*
*£7.50*
*Micro Power Ltd*

★ ★ ★

This game is indeed a novelty and also fairly difficult in its later stages and higher scores. The only description I can think of is that it is similar to the "Painter" type of game. If you like those, try it.

## Tube Way Army

*Dragon 32*
*Shoot-'em up*
*£6.50*
*Crystal*

★ ★ ★

Nothing to do with Gary Numan — this is a rather uninspired Defender. You fly across a landscape bombing and rocketing fuel dumps, and there is a cavern. I found the game frustrating rather than challenging, and in joystick mode, the only way I could drop bombs and keep manoeuvring was to bash the spacebar with the joystick. The response to controls is very slow. Nevertheless, this is not too bad an effort when you consider the game is implemented on a Dragon.

## Mission XK1

*Dragon 32*
*Shoot-'em up*
*£6.95*
*J Morrison Micros*

★ ★

Drop from the mothership and dodge the deadly asteroids to siphon up Zyphoneum from the planet Zyphon to keep you and your buddies in orbit. Landing pads are different sizes — the smaller the pad, the bigger the score: an excellent rendition of Richard Strauss's Also Sprach Zarathustra, but really only worth playing on excessively boring trips out to Clavius Base.

# SOFTWARE Shortlist

*(continued from page 45)*

Ecological stabilisation would seem to be the underlying theme of this game. The aim is to keep a fish and a swan alive in the bath. Not one of your old zinc jobs but a large Graeco-Roman effort with sluices operated by angels with wings and halos. Combined with the pacifying funereal music and the pastel colours the game creates a general air of tedium that makes you realise why Satan got so fed up sitting around on clouds knocking back the ambrosia and exploring new chord progressions on the harp that he decided to form his own chapter.

If the water level in the bath gets too high the swan will swim away; if it gets too low the fish dies. In this game you do not seek to contend against the empire but only to harmonise various natural forces — the elephant who drinks the water and the little boy who pours bucketfuls of water in at inopportune moments. You have to stolidly maintain the water level listening to more of the kind of music that makes Vangelis sound like a rock musician.

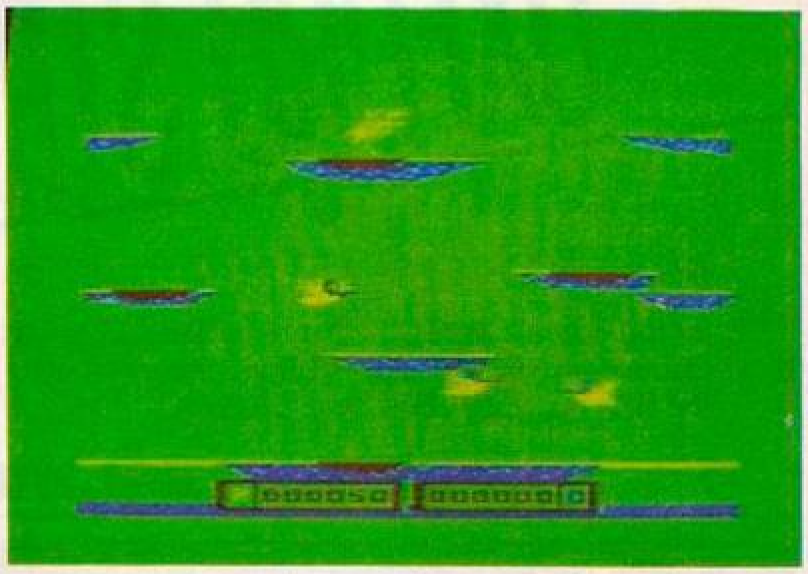
Peaceful harmonies and good graphics — but lacking the kind of addictive quality that games like Chinese Juggler can build up. That is a game about maintaining balance par excellence. It also has some kind of progression in it providing incentive. Non-violence is great, but not when it's merely allied to maintaining the status quo.

So full marks to PSS for not trotting out another space game as sequel to their excellent — but violent — Blade Alley for the Spectrum; however, there must be more to life than this.

## Buzzard Bait

- *Dragon*
- *Microdeal*
- *£7.95*

★ ★ ★



THE GAME WITH added software protection in the form of a dongle. A dongle, for the uninitiated, is a hardware fix — a gadget that plugs in to the machine without which your program will not load or run properly. You have to pay a little bit extra for the privilege of not being able to break into the program, although you can make back-up copies. You just need to use the same dongle to run them.

Having said all this, is Buzzard Bait worth protecting? It seems a little strange to have gone to all this trouble just to protect a game on a machine whose graphics capacity is not exactly stunning. Microdeal say they are test-marketing the concept and want to see how Buzzard Bait's sales fluctuate from the norm of a new Dragon game.

Exactly how you predict average sales of a computer game is a mystery to me — these things are conditional on release timing, what other software is about and what other machines are about. The fact that Dragon Data who make this home computer have recently admitted severe financial difficulties shows how quickly the microcomputer market can change.

The graphics are well-implemented showing a skyborne joust between riders on an overgrown buzzard. The game also has a one-player option. Both players are flying at the same time — birds can be distinguished by their different colours. The object of the game is to destroy all the white birds by keeping your lance above that of the enemy and flying into him. If your lance is lower then you have a long fall; if both lances are level neither rider is dismounted.

The screen displays clustered "land-masses" which hover in the air and which you can bounce around on. As the same goes on these start to disintegrate creating more room for manoeuvre. To get the bird to flap its wings you press the fire button on the joystick.

After a certain amount of time has been spent fighting a single wave, a pterodactyl appears on the screen. A mere touch from this creative spells death. If a player is knocked from his mount, the empty bird flies off the screen and — if you have a life left — player and bird rematerialise on one of the four white phasing pads.





## Mutant Herd

- *Vic-20*
- *£8.00*
- *Creative Sparks*

★ ★ ★

THIS CARTRIDGE game for the Vic-20 puts you in the shoes of a ruthless mutant slayer determined to keep the plutonium-crazed mutants out of the powerhouse. You manipulate two laser barriers to keep them out and use the same two barriers to guide your character to the mouth of the mutants' burrow.

Once you succeed in pushing the little man down one of the holes you get a second screen showing a side view of a mine with a vertical shaft on the left and a number of horizontal tunnels running off it. You have to pick up a bomb from the top, place it in the bottom tunnel where there are a number of eggs guarded by a giant ant then run back to the top and detonate the bomb by pushing a plunger without being eaten alive.

# NEWS

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## The crystal ball

Duckworths latest book is entitled *The Adventurer's Companion*, a guide to solving four popular adventures — The Hobbit, Colossal Cave and Scott Adams' Adventureland and Pirate Adventures.

Dragon owners are well catered for. Dungeon Software have Temple of Zoren and The Crystal Chalice of Quoron for the older adventurer and Giant's Castle for 7-11 year olds.

## A helping hand

Scott Graham of Lochmaben is having a few problems with Colossal Cave while Craig Williams of Staines is finding Voodoo Castle a little tricky

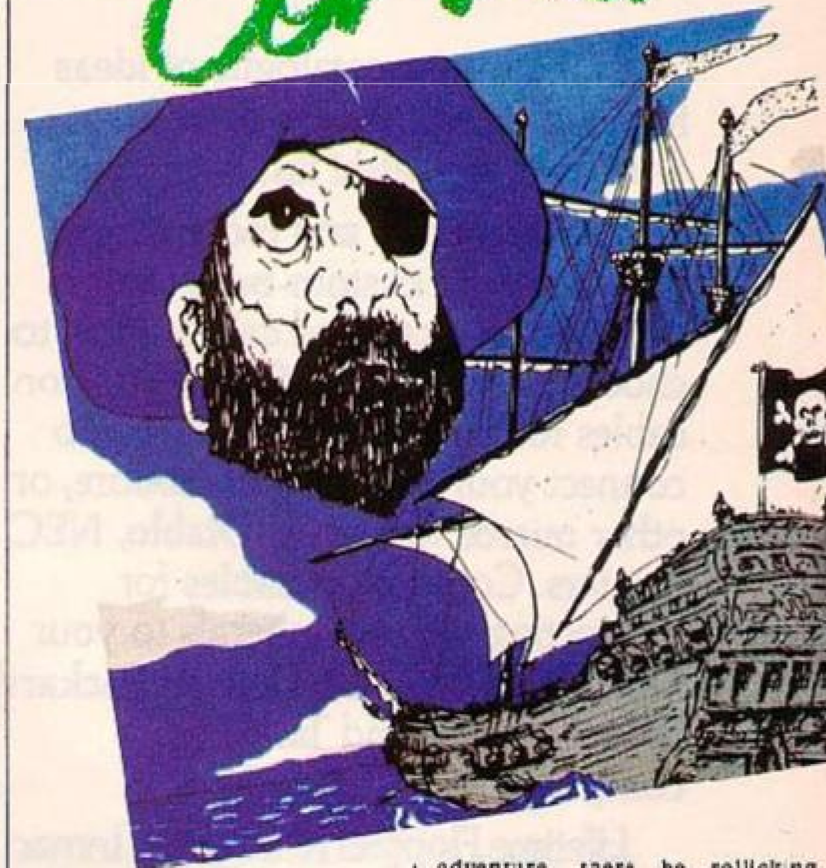
Colossal Cave
- Can't open the clam?
  TNEDIRT A DEEN UOY
- Dwarf a problem?
  MIH TA TI WORHT DNA
  EXA SIH PU KCIP
- Bear too heavy for bridge?
  DNIHEB TI EVAEL,
  LLORT EHT FFO
  DERACS
  S'IT ECNO

Voodoo Castle
- Unfinished rhyme a mystery?
  EGAP GNISSIM EHT
  DNIF
- Lucky charm causing a pause?
  LLOD NO TOOF PORD

If you're baffled, ink you quill and write to yours in mazes and monster-filled mines.

# QUEST Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.



## Flint's Gold

*BBC B*
*£6.95*
*Micrograf*

AHOY THERE, Jim lad, move that parrot, pull up a chest and harken to me while I tell 'e a tale of pirates bold.

'Tas come to my ears that old Flint buried some of his booty on yonder island. Now, me bucko, all that treasure can be yours but first ye'll have to climb aboard one of those ships moored in the harbour. Mind'e don't get shanghaied or worse — they be a rough lot of swabs in these parts.

If 'e manages to make it to the island with your gizzard unslit, there be plenty more danger awaiting. Long John'll likely be pegleggin' alongside of 'e and you don't need me to tell 'e to keep a weather eye out for Ben Gunn and Flint's ghost.

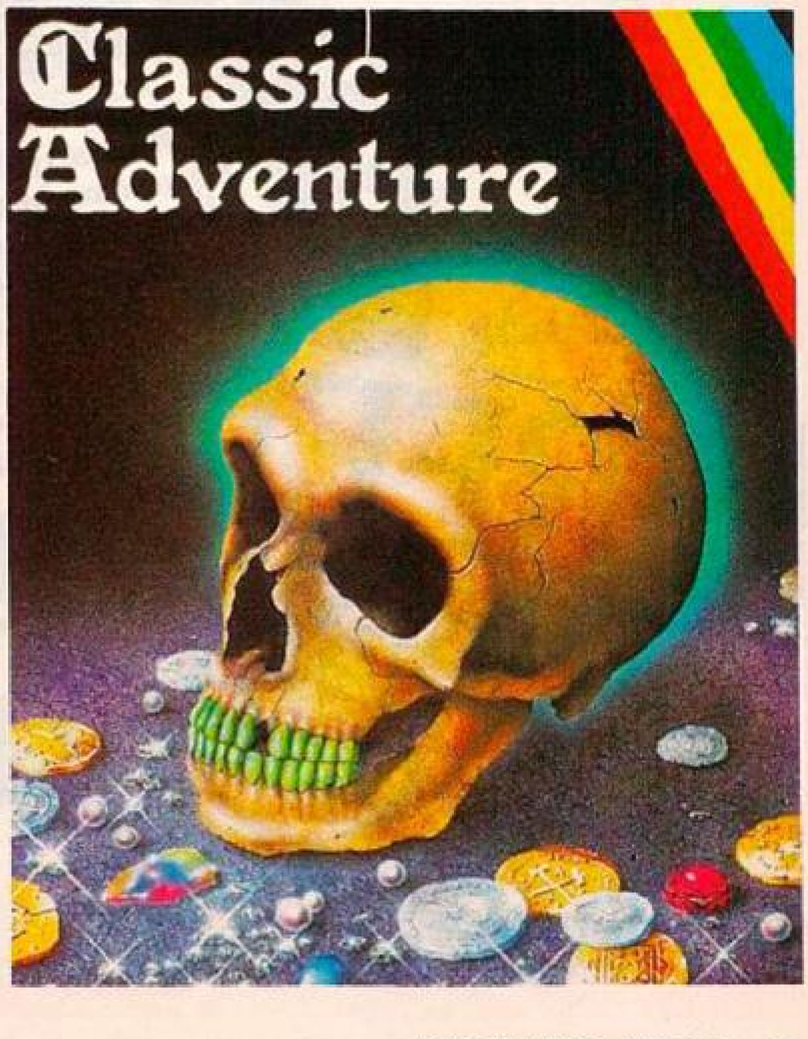
Though this be mainly a text adventure, there be rollicking shanties, squawking seagulls and crashing waves thrown in for good measure. Arr, Jim lad, that son of a sea-dog, Andy Mitchell, has come up with one of the finest yarns this side of the Spanish Main.

## Waydor

*48K Oric*
*£7.50*
*IMS Software*

THERE ARE not too many adventures around for the Oric but here's a pretty good one with both text and high-resolution graphics. Your quest is to journey through the strange land of Waydor and recover the legendary eight treasures.

The graphics and interesting full-screen depictions of the locations and are drawn rapidly. The text screen replaces the graphics screen at a touch of a key.




## Classic Adventure

*48K Spectrum*
*£5.95*
*Melbourne House*

APTLY NAMED, this text adventure is closely based on the famous Crowther and Woods Colossal Cave.

If you've never played it before, you're in for a treat. There are a large number of problems to solve and locations to explore, the latter being described in some detail.

Among the old favourites are the well house, the locked grate, the black rod and the hall of mists. Those pesky dwarves are there as well, still sneaking up and hurling axes at you. Seasoned adventures will know how to best deal with these nuisances.

Although not as comprehensive as Level 9 Computing's version (Colossal Adventure), it does include most of the flavour and delights of the original classic. Definitely one for your collection.

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## The Spectrum Connection

REVIEW

Following last month's review of the QL, Kathleen Peel takes a close look at the final version incorporating the new ROM set

# SECOND LOOK AT THE QL

THE QL AS RELEASED initially was not really suitable for business or pleasure as it had far too many faults and kept crashing. The final version of the QL incorporates the ROM set AH which has overcome some of the criticisms levelled at the first QLs, which were fitted with the FB ROM set.

Those criticisms covered all aspects of the QL: it was slow, had an unfriendly editor, the microdrives were prone to lose files and data, there was no documentation other than for the Psion packages, the network would not allow integration of Spectrums, the RS232 interface had bugs in it, microdrive files in a well-used cartridge would take an age to load, the keyboard felt a bit clattery with a sticking enter key, and so on.

The AH version of the ROM is Sinclair's answer to most of the problems, but it does not present a cure for all the QL's troubles and can not make any difference to the hardware faults.



The first improvement to look at is speed, the new ROM QL's are quicker and the following table gives the benchmark times and puts them into perspective by comparing with other well-known computers.

| | Amstrad | BBC | IBN | Advance | QL-FB | QL-AH | ZX80 |
|---|---|---|---|---|---|---|---|
| | £330 | £399 | £1570 | £400 | £400 | £400 | — |
| 1 | 1.1 | 1.0 | 1.2 | 1.0 | 2.0 | 1.9 | 1.5 |
| 2 | 3.3 | 3.1 | 4.8 | 3.4 | 6.0 | 5.5 | 4.7 |
| 3 | 9.2 | 8.3 | 11.7 | 7.4 | 11.0 | 9.4 | 9.2 |
| 4 | 9.6 | 8.7 | 12.2 | 7.5 | 10.0 | 9.2 | 9.0 |
| 5 | 10.2 | 9.2 | 13.4 | 8.2 | 14.0 | 11.7 | 12.7 |
| 6 | 19.0 | 13.9 | 23.3 | 14.8 | 27.0 | 24.0 | 25.9 |
| 7 | 30.2 | 21.9 | 37.4 | 23.6 | 69.0 | 43.4 | 39.2 |
| 1 | 34.2 | 52.0 | 30.0 | 26.0 | 23.0 | 21.0 | N/A |

There is no getting away from the fact that despite all that is said about the QL, comparatively speaking, it is slow other than when performing mathematical calculations, and normally the predominant functions are not mathematical.

The editor although a substantial improvement over the earlier effort is still not good enough. A full screen editor is the minimum requirement for a "next generation" user-friendly computer, not something that requires setting up to provide anything more than basic facilities.

There is about 4K of ROM unused, which makes it hard to understand why a full screen editor has not been implemented.

If a basic input line exceeds three lines in length in the command and error channel window, error messages associated with the line will not be seen unless that window is expanded to the detriment of output and listing channels. Although the user is able to scroll the window forward, it does not appear possible to scroll back up the line.

The loss of data from microdrives was extremely serious and previously prevented me from using the QL in word processor mode. This problem was a little mystifying as the Spectrum microdrives have worked perfectly for the last nine months without any problems.

Fortunately the QL's (AH version) microdrives appear to be working normally without the problems that were apparent on the very early FB version of the QL.

The other microdrive problem of program loading times, is improved slightly by using a scatter load technique, but the user is still left with the distinct impression that the QL is slower than the Spectrum microdrives. This is not helped by the frequent microdrive accessing that takes place while using the Psion packages.



A problem exists in determining at what stage a package is loaded, so I have provided the time to load Quill in a "ready to start a new letter" state and the shortest time taken to load Quill and this article, that includes pre-typing and buffering commands to reduce the time to a minimum.

Loading times:

| | QL-FB | QL-AH | article |
|---|---|---|---|
| Quill | 70s | 42s | 3m 40s |
| Abacus | 77s | 38s | |
| Archive | 73s | 42s | |
| Easel | 72s | 50s | |
| Install-bas | 68s | 32s | (300 lines) |

The article is about 2900 words long which is approximately 18k. The Spectrum microdrives only take an average of seven seconds to load an 8k program so what on earth is going on? Even allowing for a considerable improvement in knocking, on average, 30 seconds off the loading times, these figures are in no way comparable with disc-drives and frankly are not good enough.

The documentation supplied with the QL is

reasonably comprehensive in terms of content and suitable for the average computer user. It is not really ideal for a novice who will find many of the sections difficult to understand.

The keywords are provided in alphabetical order with examples of each keyword showing some of the types of syntax used by the keyword.

There are some notable omissions from the list of keywords. The ones I found most irritating were the lack of an ON ERROR and RENAME. The ability of the QL to work with a procedural list which may be local to the current program or globally setup on system boot via RESPR is very very useful but it is short-sighted to restrict use of this powerful concept to machine code for want of a few hundred bytes of code in ROM.

While Formatting a drive, the type-ahead buffer appears to be limited to seven characters.

The mathematical functions ASIN and ACOS are present in ROM but not in the Keyword list. Trying the standard scientific calculator test of taking sine, cos etc and then the inverse gave results with an accuracy about the same as the Spectrum. The scientific accuracy seems to depend on look-up tables which do not give highly accurate results. As in any test, arbitrary values are chosen to evaluate and the real accuracy may be worse.

There is an error in PI which gives a value of greater than one at 90° i.e.

PRINT (SIN(90*PI/180))—1 IS POSITIVE

This results in a whole range of errors with trigonometric calculations that use PI.

The only way to find out how good Superbasic is involves using it, so I wrote a 68000 disassembler. I must admit that Superbasic was very easy to control and helped produce a Basic program which looked better in readability, the only real difficulty was in trying to alter procedures and not being able to view the remainder of the procedure. This just emphasized the lack of a screen editor.

Unfortunately, it is still possible to crash the system, the fault lies somewhere in the renumber and auto commands after having aborted a procedure with "break".

The output was extremely difficult to format, there was no special print control similar to the IBM PC's "print using". One other rather strange point was that the QL rewrote "lprint" in a program in capital letters indicating that it was a keyword, which it is not.

Interfacing via the non-standard telephone plug type EICC RS232 sockets now appears satisfactory and all RS232 communications tried were successful. The lack of split speed 1200/75 working does put a limitation on use that seems hard to justify but other than that there is no criticism of the interface.

The network interface still does not allow what one would have thought of as normal operation, i.e. A QL main station with many slave Spectrums and QL's, a situation that one might expect in an educational environment. The Spectrum sends down the net tokenised keywords, which the QL cannot understand. Considering that early publicity mentioned such a networking capability, it is a little disappointing to find that it still cannot be done.

Multi-tasking is a claimed feature of the QL, which the literature omits to explain is only available via machine code, again a great pity as the stack control necessary to provide multi-tasking from Basic does not appear too difficult or greedy in terms of machine code length.

The documentation provided gives an insight into the capabilities of the QL, which are very considerable. As long as the development of the QL continues, then within a six month period all the necessary improvements could be made and a computer that would compare with other Sinclair products for innovation and technical expertise would be available. However, failure to make these improvements could have serious consequences for Sinclair. There are better, faster and cheaper 8-bit machines for the games enthusiasts and on the business front, competition is already intense.

Sinclair appears to be moving into the single board OEM market. A manufacturer buys the bare board, adds his own operating system in ROM, puts a different case around the board and sells it as an own-brand business computer. The advantages to the QL user could be quite substantial, if some of the alternative operating systems were floppy disc based and used an accredited operating system like UNIX, a field which Motorola are keen to exploit. There would be ample opportunity to upgrade to a standard operating system and

*Sir Clive Sinclair has come in for some hard words over late delivery of the QL. Will criticism be stilled now the final version is being delivered?*



perhaps a better high-level language as it is unlikely that OEM equipment would contain Sinclair SuperBasic.

Some pertinent observations should be made regarding the performance of Quill. This package certainly does most of the things you would expect, but the overriding impression is one of it's slowness. In providing a wide range of facilities someone forgot that the principle requirement is one of speed, and that sitting around waiting for the drives to stop and release the keyboard while you take a temporary copy, and move through the text, or the agonising wait, question and answer routine to load Quill and a document is not what it is all about. I can do better with Tasword on a microdrive working with a Spectrum.



The problem is that the package is not matched to the hardware, both items appearing to have been developed in isolation.

Quill should be better on a half megabyte QL. But that's not available and puts the QL into another price range. Regrettably it's present size makes it unsuitable except as an occasionally used word processor.

The Psion packages are inconsistent in command entry syntax, sometimes requiring just the first letter to be typed, at other times ENTER must be typed as well, some commands are selected from a menu and others are toggled on and off, the same letter can mean different things depending upon the menu currently in force, which can be very confusing.

Deleting backwards is very hit and miss as the user invariably tries to delete a word with five or six quick key presses only to find that the display lags rather a long way behind.

As an example of the use of the Psion package, imagine I am working on a short article of 1000 words. I already have one copy of 500 words on microdrive 2 and I wish to take an interim copy of the latest version which is up to 750 words. This is the sequence of events:

1 Press F3 key followed by 6

(this calls up the command menu-s=save. A period of 35 seconds elapses by which time the computer has found the save section of Quill and then asks if I wish to save the default file, i.e. the file I am working on.

*(continued on next page)*

*(continued from previous page)*

2 Press ENTER

(after a further 10 second the computer finds that the file already exists and asks if I wish to overwrite it.)

3 Press Y

(a period of 100 seconds elapses while the old file is erased and the new one saved and verified in it's place, the user is then asked if he wishes to carry on with the same document.)

4 Press ENTER

(Why a further 25 seconds is required here is beyond me as the file must be in memory as we have just saved it). Unfortunately, the file is now at the start, so to get back where I was:

5 Press F3 key then G following by B.

(The Goto procedure to get to the Bottom of the file, a further 28 seconds).

For a larger file, item 3 becomes:

3000 words 200 secs.

That's a total of 3 minutes 18 seconds for a 750 word document, and all I wanted was to save a document form and then continue.

The commands can be typed into the buffer and executed in sequence but they still take over three minutes to complete.

**CONCLUSIONS**

- The new ROM has improved times for benchmark tests compared with the earlier FB version, but the QL is comparatively slow other than when undertaking mathematical calculations.
- The Quill word processing package has a comprehensive range of facilities but in practice is slow to use.
- Program loading times via the microdrive appear to be slower than on the Spectrum.
- Despite the fact that it is a multitasking machine the QL does not provide spooling of printing with input operations.
- In hardware terms the QL currently represents the ultimate in technical achievement in computers priced at £400.

If after saving the file the user does not press ENTER to the request "save, same document", which is in fact asking if the user wishes to continue with the same document, the data file is dumped and the user ends up with a blank page — not exactly user friendly.

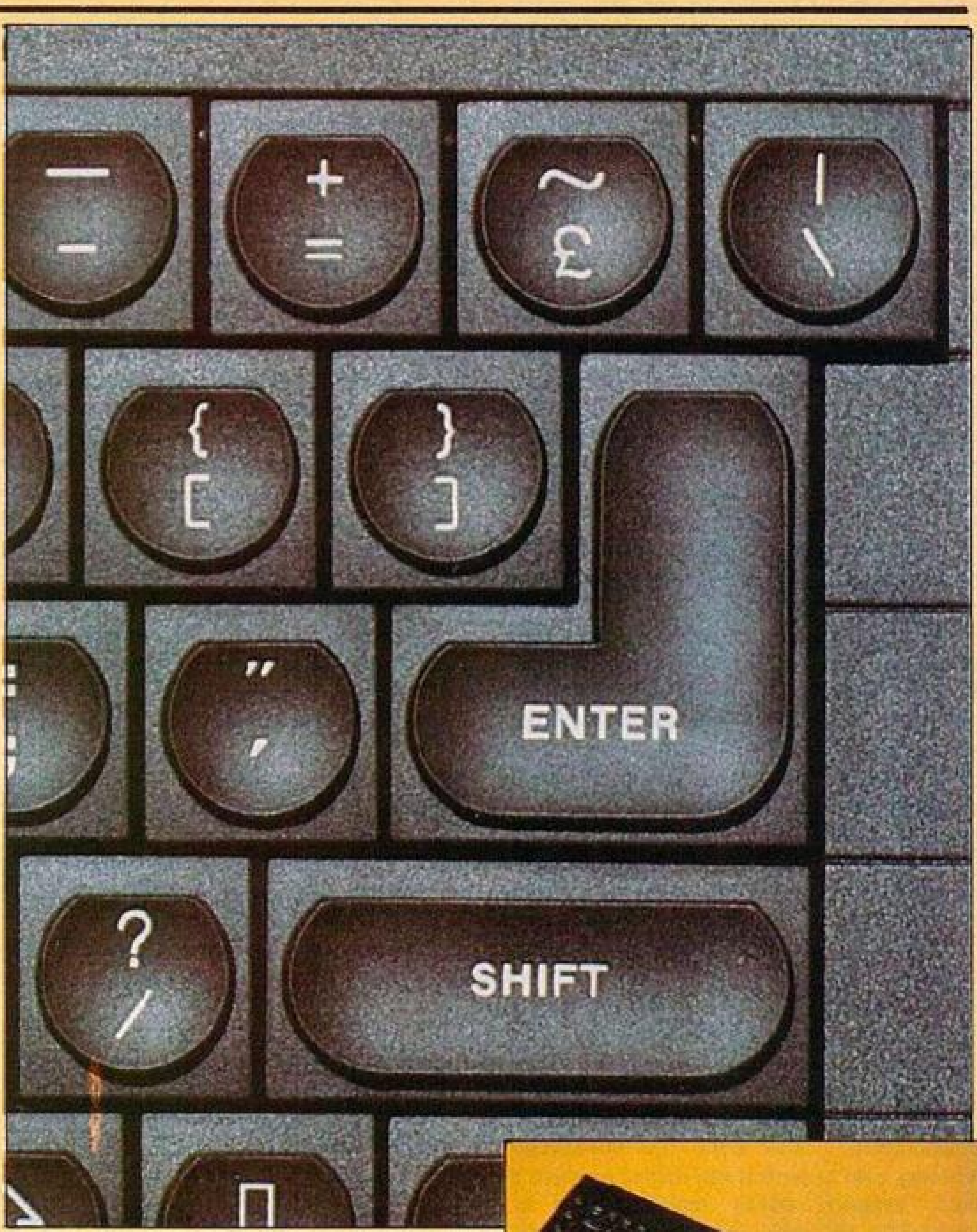
I had hoped to be able to recover a document from microdrive in the same system state as when the file was saved, unfortunately Quill requires the user to reconfigure much from the default set-up every time.

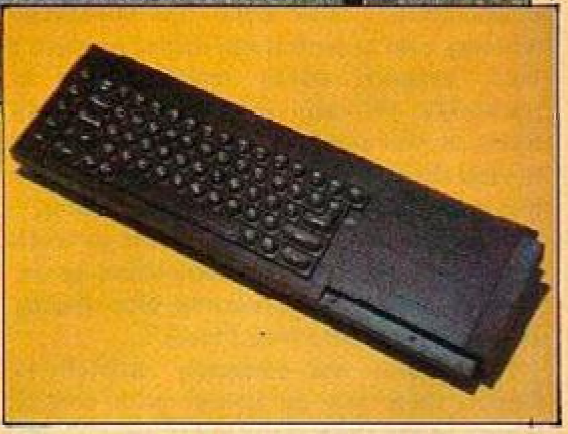
I had also hoped to be able to load the "def doc" automatically instead of having to specify the document I wished to use.

Quill does not support wild card operations and the search and replace facility is not automatic, requiring a response from the operator at every occurrence.

It does not appear possible to import program files into Quill although files can be imported from the other Psion packages.

Perhaps printing is better? But no, even with this multitasking machine, while the printer was working, I could not. I had hoped



that the document could be printed whilst I worked — it's just a case of spooling a copy as a lower priority job. Worst of all, it sends me back to the beginning of the document when it is finished.

This document takes over six minutes to print at 1200 baud on an 80 character per second printer.

When the part of the document in memory reaches a certain size, either all or a part is dumped to microdrive and although while this occurs the user can still type, nothing happens on the screen until the drives stop.

The block erase facility is controlled by the cursor keys which enable the user to "surround" the text to be erased. Unfortunately, if the user overscans the block to be erased, it does not appear possible to reduce the size of the text block to be erased and the user is forced to ESC and restart or to complete the erasure and re-enter the text deleted, but still required.

In spite of what is claimed in the manual, a default page size of 0 does leave breaks in the document, at steps of 256 lines, although it does not number the breaks as pages.

The Quill designers have to make up their minds as to whether Quill will include all the facilities of the best word processors or try and produce a more realistic match between software and hardware in an attempt to obtain a reasonable level of performance.

If you already have a monitor it probably will not be compatible with your QL. The picture will overscan on most monitors and some TV's. This is a function of the flyback time and to cover the problem Microvitec are producing a special QL compatible monitor.

There has been a lot of discussion about the speed — or lack of it with the QL. This review is based on the usual set of tests used in all the reviews I prepare. In this instance, more detail is given to provide the reader with enough information to come to a personal view about the QL.

What appears to be out of keeping with such an advanced hardware design is the retrograde step of going back to a line editor to support a very sophisticated but unfortunately slow Basic.

That said, it must be conceded that the hardware represents the ultimate in technical achievement in the under £400 range and probably some way beyond. ■


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# SPECTRUM SOF

IN THE HEART of the city the seven leaders of the industrial west talked world affairs. Across the river, in a darkened room, a Spectrum worked overtime. Two days and 25 programs later its owner reappeared, unshaven; blinking into the light. Battle had been done, but had he won?

Among these Spectrum games it's tough picking a winner, but any prize, if prize there must be, should go to Melbourne House, for their excellent new game, Mugsy.

Mugsy ain't nuttin' special in da concepts — gangsters, can ya play da Godfather and live etc. — but da production is da best. Graphics to keep ya lookin', animation to astound and gangster scenes and gangster talk all combine to make this irresistable. Which is odd, as the logic behind the gameplay is simple, and there aren't that many different possibilities. The wit sustains the game, the presentation does the rest. The chances are that you'll be rubbed out pretty soon anyway, but play while ya can.

About a dozen games into the weekend Airbase Invader, from CP Software, popped up on my screen. In it you're Annie, the peace woman, and your only weapon is the ability to blow kisses. You have got through the wire at Greenham Common and you're trying to stop President — aka Ronnie — Raygun clones, whose only aim is to press the red button. On your way round the bunkers you meet all sorts of vaguely familiar characters, among them Old Bill and the Iron Lady — a heart of steel . . . — and have to avoid them or use kisses to send them away.

## Original graphics

In play the game is quite stimulating, but not exceptional. However, like Mugsy, the original graphics carry it off, and it's very hard to stop Raygun pressing that button. Incidentally, there's an interesting footnote — "Any resemblance of any character in this game to any person living or dead is unintended and entirely coincidental." Or dead? . . . And Raygun is spelt differently on the screen too . . .

There are fewer new text adventures around than I'd expect — either people are running out of ideas, or the good ideas are being incorporated into graphics games. Anyway, here are three, all of which hinge round flight — Spyplane from Gilsoft, Alien Adventure from Stephen Hartley Software and Kosmik Pirate from Elephant Software.

Alien Adventure is the wittiest and therefore probably the most engaging of the three, although I never succeeded in getting far. You start on another planet and have to get back to earth. You meet a more interesting variety of creatures on your way than usual, but tend to end up dead, rather than safely home. And if you refuse to play another game you get called a spoilsport. Worth more time than I had, and reacts well to abuse, a tactic most adventurers resort to.

Spyplane sets you up as one, flying above the enemy, trying to get information on their military and naval forces. I spent more time flying into the sea or low mountains, and in the end got bored — it's more of a mind bender than I wanted, and required the kind of painstaking use that only the most dedicated players will give it.

## Complicated

In the same vein, but in space rather than sky, Kosmik Pirate will demand as much as you've got to give, if not more, if you are to make any progress. But I found the game too complicated, and the screen display, although more interesting than that on most text-based games, was so complicated that it would take months to understand fully. This may be a selling point, but I'm too impatient for it. And I may have spent too much time in space already.

Only two really unlikely titles in the software sack, the best of which has to be Revenge of the Killer Tomatoes, from Visions Software Factory. Unfortunately, the game doesn't match up to the title, and the storyline is even thinner than you'd expect. Cabbages move round the garden, tomatoes chase you — and later, pumpkins and mushrooms too — and you do your best to tread between cabbages, picking weeds. Nice sprite-type animation, but it doesn't rescue a rather pedestrian game.

The other appealing title is Disco Dan, from Gem Software, which has nothing to do with discoteques, and more with leaping about from disc to disc. Quite exciting, and a starter level to whet your appetite before you even get that far. Similar in many ways to the various Q-Bert games, but more addictive, and to my mind more enjoyable too. Dance? . . . I could have tried.

Three more to add to an increasing army of games that combine the fun of adventuring with the visual appeal of graphics, and all three are good value; Titanic from R&R Software, Millionaire from Incentive and Howzat! from Wyvern Software.

Titanic comes in several parts, all of which simulate accurately what you would have to do in real life if you were to try and find treasure aboard the Titanic. Get sponsorship, spend it, find the ship, and then find the treasure inside.

Most of the wrecks you find seem to kill off your divers, so you'll need more than one team. A pity that I found the treasure on my first trip, but in subsequent games I couldn't, so it must have been luck. Well thought out, lots of graphics, and stimulating all round.

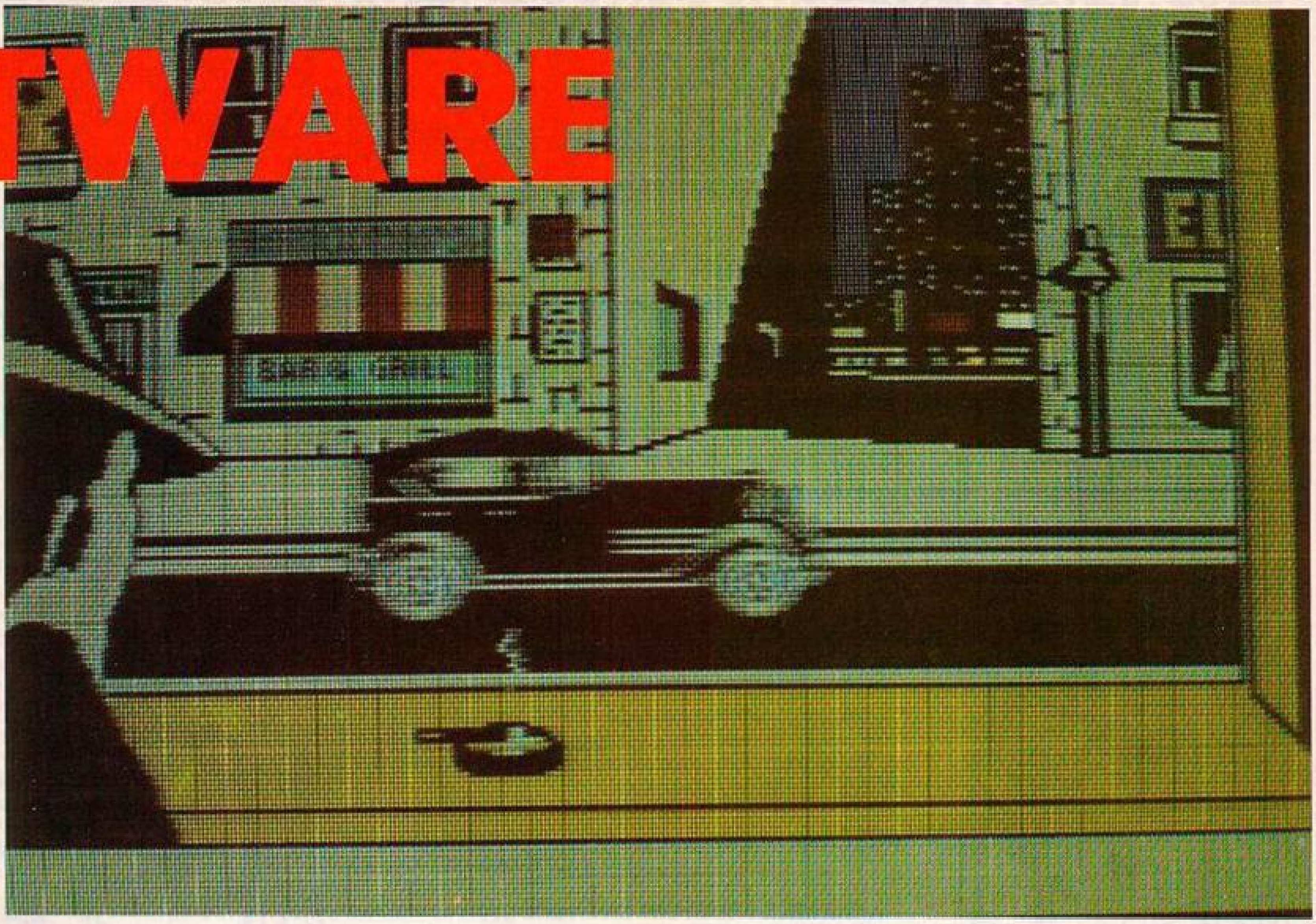
## Making money

Millionaire, predictably, is about making money. Starting a software company to do so though is a novel idea. How much time do you spend programming? How much money on advertising? Can you trust Honest Harry's deals? All good stuff, and graphically sound. The only disadvantage is that you don't get much variety from month to month, and the game can get a bit wearing. Enjoyable, but for how long?

Howzat! is not technically an adventure, but is played like one. It must be the best cricket game on the market — just the thing to get out when rain stops the real play. You can have any of the County or Test sides, select from the squads, change the skill levels of players, and get full batting and bowling cards, as well as an excellent scoreboard. And the game graphics are good too — watch the players running for the ball or the wicket, and change the field. Like the real thing it takes hours; after 45 overs I stopped for tea. Excellent.



# TWARE



Both Metagalactic Llamas from Salamander and Blade Alley from PSS are classic shoot 'em up games, though their origins are very different. The Llamas game is an adaptation of the arcade game which I never liked. You either love or hate this version too, and I didn't love it — although inquisitive neighbours did. Blade Alley is a 3-D shoot up version of space invaders with about as much *raison d'etre*. However, it is curiously addictive, and has a wide variety of things flying at you. A shame I couldn't use it with Currah's Micro speech.

The best games are often just variations on an idea that has been going round for years. Unfortunatley, so are the worst. Eric and the Floaters, from Hudson Soft, is based on an interesting idea — go round a maze, demolish bits with bombs, try to find treasure, and destroy the balloons — but although you keep playing the game you end up asking yourself why. Semi-addictive, useful graphics, some visual appeal — a rather ordinary game. Perhaps because the cover is better than the contents.

This also applies to Carpet Capers, from Terminal Software, which is fun to play, but completely pointless. Very clever, what with its smooth scrolling, and complete absence of flickering movement, but it failed to hold my attention. Laying carpets isn't my line. Neither is playing RED/Sunshine's Zipper Flipper, computerised pinball for the home. Pinball has a physical charm which doesn't translate to the screen, which is a pity, as, like Carpet Capers, it's all very cleverly done.

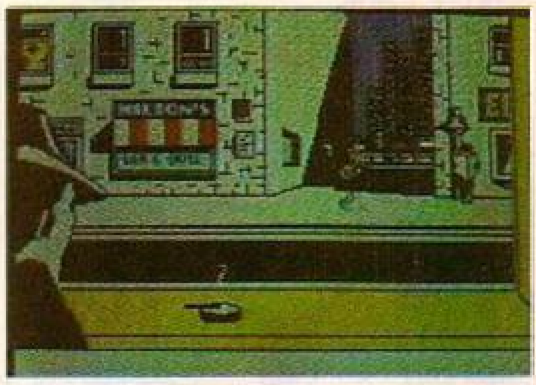
Three from Pulsonic — Worm Attack, Butterfly and Opposition — fall into the same category. All very well programmed, but Opposition could be better played on a board, and Butterfly and Worm Attack just aren't that interesting. No doubt they'll be played, but will they be remembered?

And lastly, Trom from DK'tronics. An afternoon hobby, and a tricky, fast action game. After the first afternoon the novelty wears off. More screens might have done the trick . . .

Carnival, from Eclipse Software, puts you in the shooting gallery, but it's more fun and harder than it sounds. Blasting away randomly doesn't help, but being methodical in your shooting does. Appeal for all, and nice graphics.

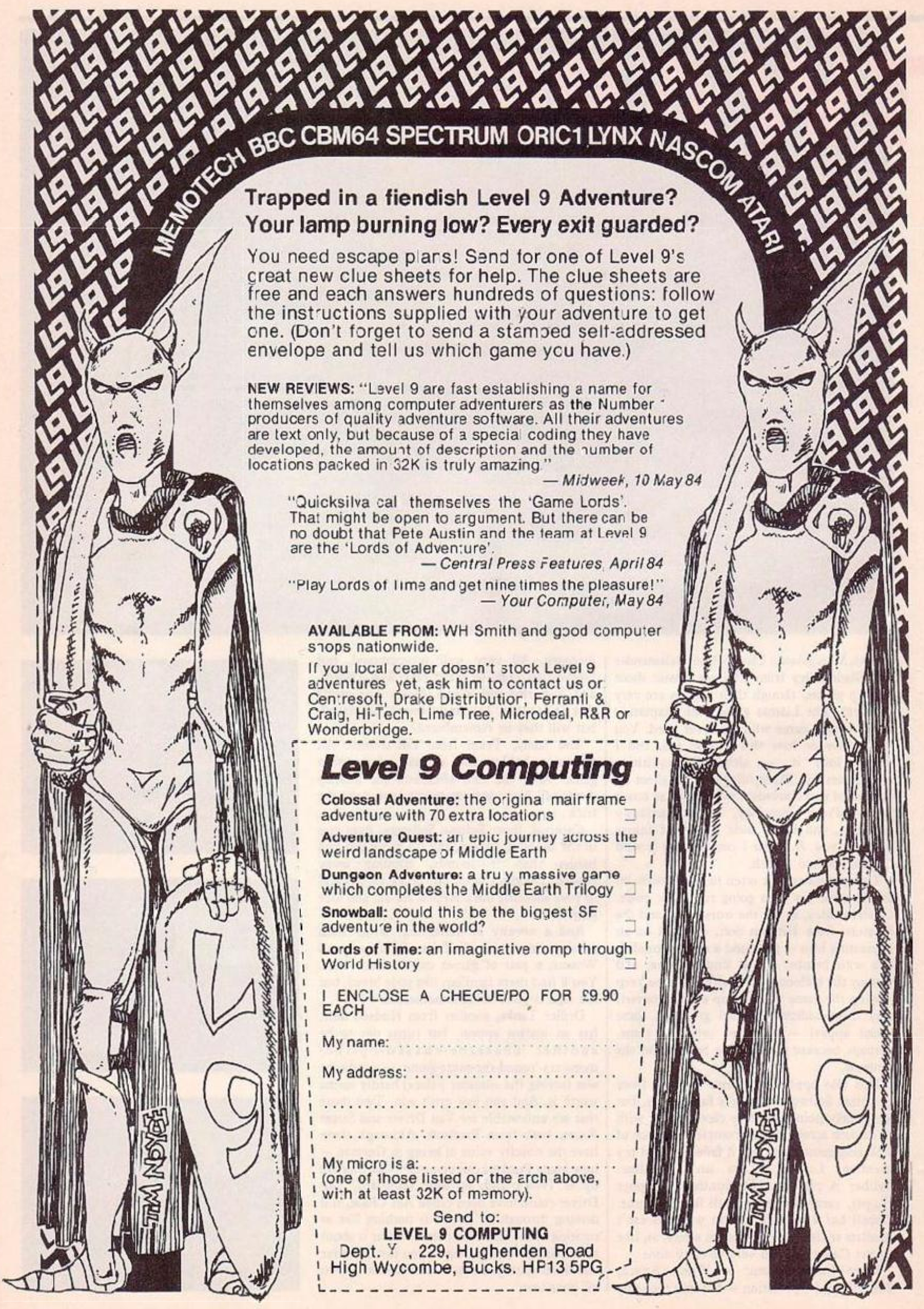
And a novelty of marketing, rather than gaming must be K-Tel's Defusion and Worms, a pair of games on the same tape. You'll find them familiar, like stale bread, but the tape is good value nonetheless.

Driller Tanks, another from Hudson Soft, has an instant appeal, but turns out to be another chase/be-chased-by-the-monsters-'round-the-maze-game — and the aim (saving the summer palace) hardly seems worth it. And you just can't win. Two more that are unbeatable are Van Driver and Street Racer, both from Profisoft. Although these have the novelty value of being in German — how many Panktes can you get? — neither are up to 1984's high software standards. Van Driver could have been called Ant Chase, and driving through its streets is nothing like as exciting as the real thing; Street Racer is about as exciting as washing up — you just go faster and faster until you crash. Games to keep you off your toes.








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# BBC ROMS

**Richard Lambley looks at additional facilities now available in ROM**

THE BBC MICRO is the only home computer which allows you to have more than one language on board at once, and the software suppliers have taken advantage of this useful feature to provide not just languages in ROM, but a wide range of utilities.

Beebug's Toolkit ROM is a collection of routines for developing and debugging Basic programs: it is described as a Basic programmer's aid, though you don't need to be an experienced programmer to find it helpful.

Some of its functions simply enhance the resources BBC Basic already has: with it, for example, you can renumber individual sections of programs, rearranging blocks of code at will.

But there are many completely new facilities: a "bad program" recovery command, a program packer and Rem stripper, a relocator — useful for disc users — a Check command for verifying programs saved, and a quick method of merging programs together.

The great delight of Toolkit, though, is its error-trapping. Even if you use the keyboard only for typing in games listings, this could save you untold frustration in tracking down trivial mistakes.

One especially useful facility is string search, which scans the program for any sequence of characters you specify, Basic keywords included. The display shows all lines in which the sequence appears, each occurrence highlighted in colour. Allied to this is a search-and-replace utility.

Toolkit's use is restricted to Basic only — it cannot deal with machine code — so to get the most out of it, you need to pair it with a good machine code monitor — such as Beebug's Exmon, or Beebmon — of which more below.

Some of Toolkit's commands are less useful than others; nevertheless, it must be one of the most worthwhile utilities yet produced for the BBC Micro, and at £27 it represents excellent value for money. There is a discount for Beebug subscribers.

Another interesting extension to the standard BBC is provided by Computer Concepts' Graphics Rom costing £33.35. This miscellany of graphics functions falls into three parts: a collection of Logo-style turtle graphics commands for drawing patterns, some sprite utilities, and a number of useful tricks. These include a quick *Circle command, which can whistle one up in just a sixth of a second. It's actually an ellipse, because the BBC's pixels aren't quite square; but no matter, you can always make a real circle using *Arc.

**Nosuchvariable**

*Figure 1.*

There's an intriguing *Plot command, which extends the Basic plot command into the third dimension. And there's *Rotate, which twists the whole screen about a point, making what follows appear on the slant. Some other useful features are a routine for filling shapes on the screen, a *Print command which can produce letters of any size, and a way of getting an endless supply of coloured pattern effects.

The GDUMP ROM from DA Computers offers machine code graphics dumps for a variety of popular printers, including models by Epson, CTI, Star, Seikosha and NEC. The single *Gdump command can be followed by up to nine arguments, which determine the number of shades of grey, the logical background colour, the size of the print-out, which way up it is to be and so on. Sensible default assumptions have been made, so most of the time you don't need to specify more than two or three. The last four arguments define a "print window" for dumping just part of the screen.

Gdump works in all graphics modes including mode 7: in this mode it does not give colour shading or double height characters, but it reproduces block graphics successfully and quickly in a 40-column-wide print-out. At £20, it's good value.

A fuller set of printer utilities is available from Computer Concepts in their Printmaster ROM, which at present is available only in an Epson version. Its shaded graphics dumps look much like those of Gdump, but Printmaster can do a colour dump even in mode 7. The many size and scale options do not apply in this mode, but it copes with double-height characters and separated graphics too.

Printmaster also includes a character definer; though here, I think, Computer Concepts have for once missed a trick. Instead of giving us a definer to make downloadable characters for the printer — this is, after all, an Epson printer ROM — they have chosen to make it an eight by eight definer for the computer itself.

*Figure 2. Vital statistics: this "info" page from Beebug's Toolkit gives a handy summary of the state of play.*

```
TOOLKIT 1.21
  FX  3 0          FX  4 0
  FX  5 1          FX  6 10
  FX  9 25         FX 10 25
  FX 11 50         FX 12 8

  @%=&0000090A

  LISTO  7         WIDTH  0
  ERR    26        ERL    30

REPORT: No such variable

Free memory = 25102 bytes
Program size=  2034 bytes
Next free location= &19F2
PAGE= &1200  LOMEM= &19F2
TOP = &19F2  HIMEM= &7C00
OS 1.20
```



*Picture by Graphics ROM, screendump by Printmaster.*

Another interesting package for printer owners is Beebfont from Watford Electronics. If you're bored with the character set Acorn sold you, with this you can freak out. When I tried it out in the office, it reduced everyone to helpless giggles within moments. There's something irresistibly nutty about a computer which can do things like figure 1.

Those Gothic letters come from one of six alphabets built in to the Beebfont ROM. A further font can be loaded into RAM, and letters from any of them can be mixed together on the screen or on the printed page.

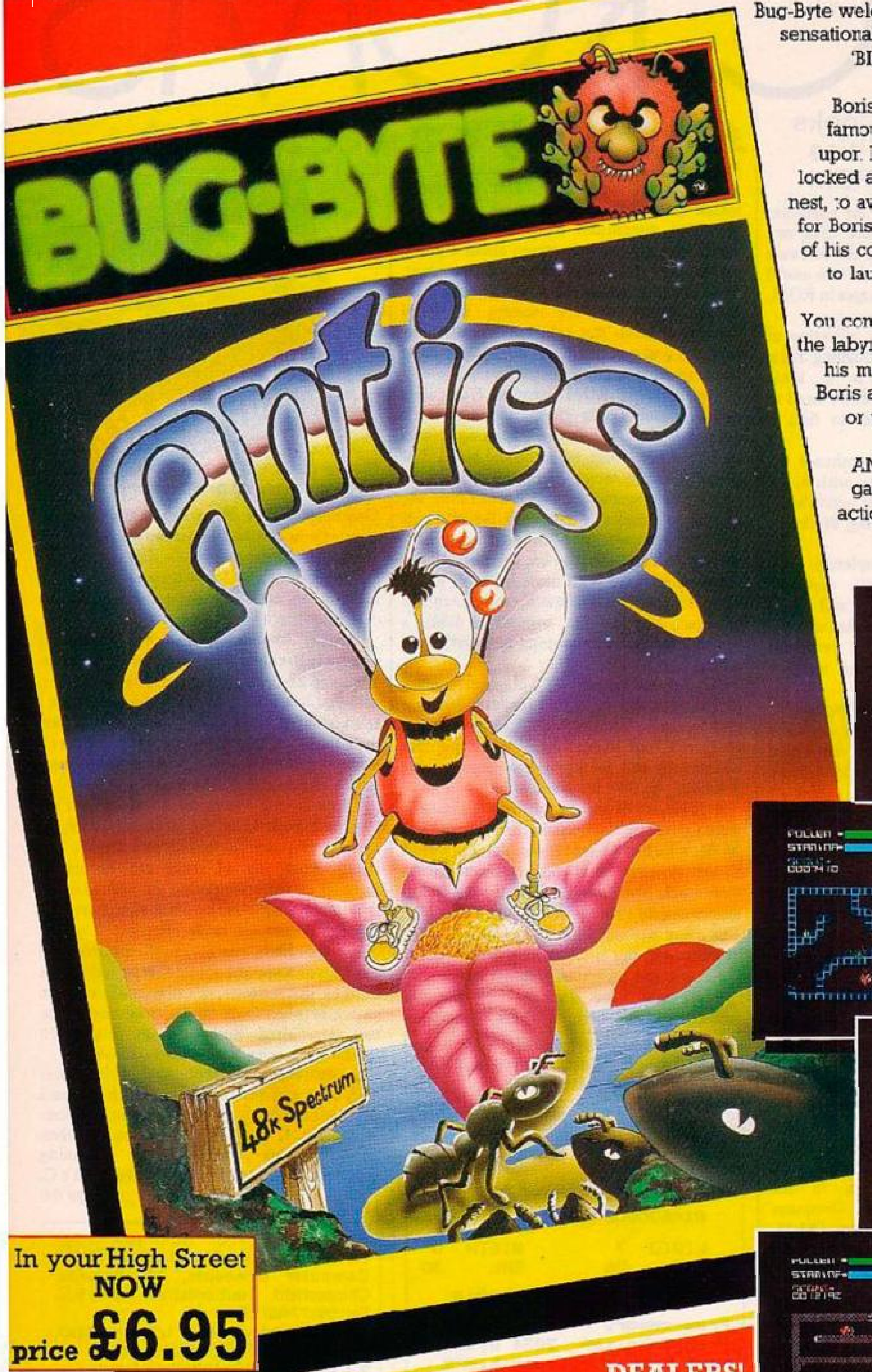
Printing with Beebfont is a slow business, but the results are quite effective. You can dump Wordwise text files to the printer with the help of a spooler routine, supplied on the utilities disc/cassette. Escape commands to switch between fonts can be embedded in the text as required. Beebfont costs £39, which for a 16K-byte eprom seems reasonable.

Incidentally, Beebfont and Printmaster both have a *Font command, which can be a cause of conflict: if you fit both, put Beebfont in the higher priority socket. You can then eliminate any confusion by prefixing commands intended for Printmaster with a C.

(continued on page 61)

**Beebugsoft**, P.O. Box 109, High Wycombe, Buckinghamshire HP11 2TD.
**Computer Concepts**, 16 Wayside, Chipperfield, Hertfordshire WD4 9JJ. Tel: 09277-69727.
**D.A. Computers**, 104 London Road, Leicester LE2 0QS. Tel: 0533-549407.
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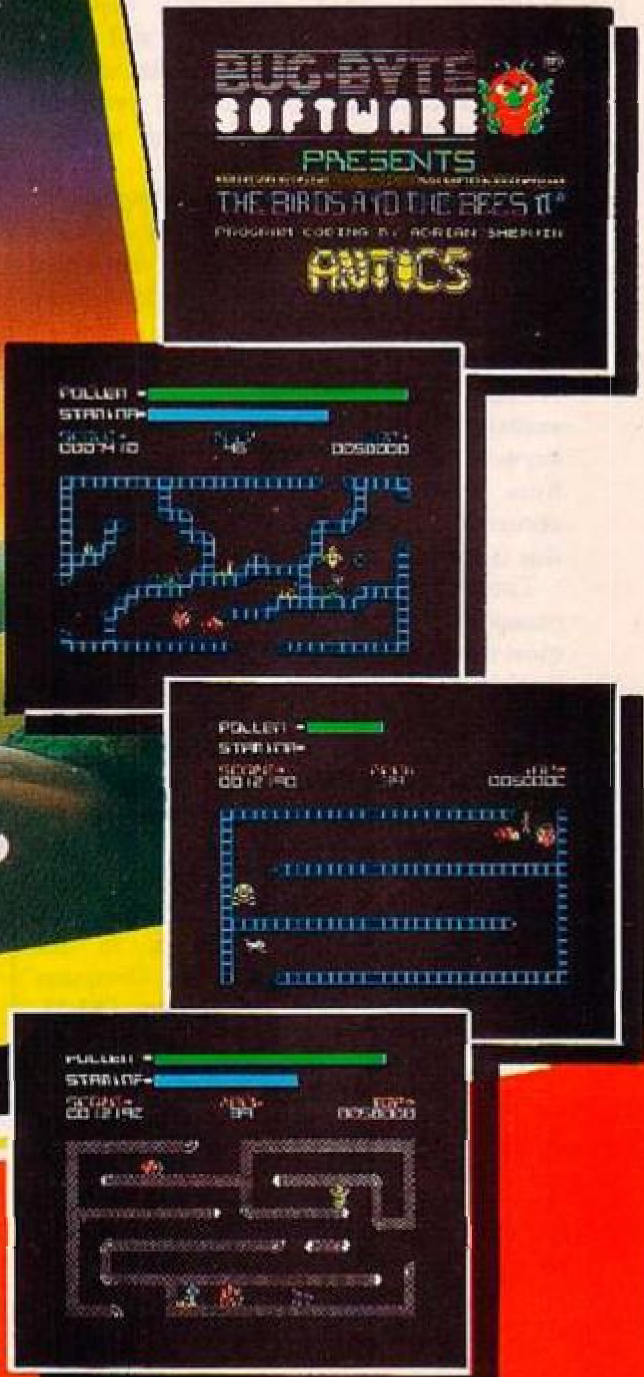



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(continued from page 59)

The others will be claimed by Beebfont, which gets the first say. A similar idea is used by Toolkit: in this case an optional B prefix allows you to avoid tangles with the many other ROMS which have a *Edit command.

In spite of having high-level languages such as Basic, most home computers are pretty primitive when it comes to controlling external hardware. Getting even the BBC to do a simple thing like switching your reading lamp on is far from straightforward. When you've connected up the mains switching device, you then have to work out how to address it. You need to know which memory locations to write to and what to write, and you need more than a passing acquaintance with concepts such as data direction registers.

The Control Rom from SJ Research takes care of all these details for you. It acts as an additional filing system, so you can carry out read and write operations through it just as you would with cassette or disc files. And though it's hard to think of the 1MHz bus or the user port as a file medium, making a pin on one or other of them switch "high" or "low" becomes simply a matter of opening a channel to it and putting a byte to file.

There is a small price to be paid in terms of memory: the Control Rom claims four pages for its workspace when you switch on. If you use cassettes or the Kenda disc filing system, you will find Page set to &1200. If you have teletext, an Acorn DFS and Econet, you'll find it at &2900! However, when you don't need I/O facilities you can reclaim this space by typing *Noio followed by a hard reset. The price is £44.85.

*Figure 3. Same Prestel page, different screen-dumps. Gdump is six times faster, but Printmaster gives you more frills.*



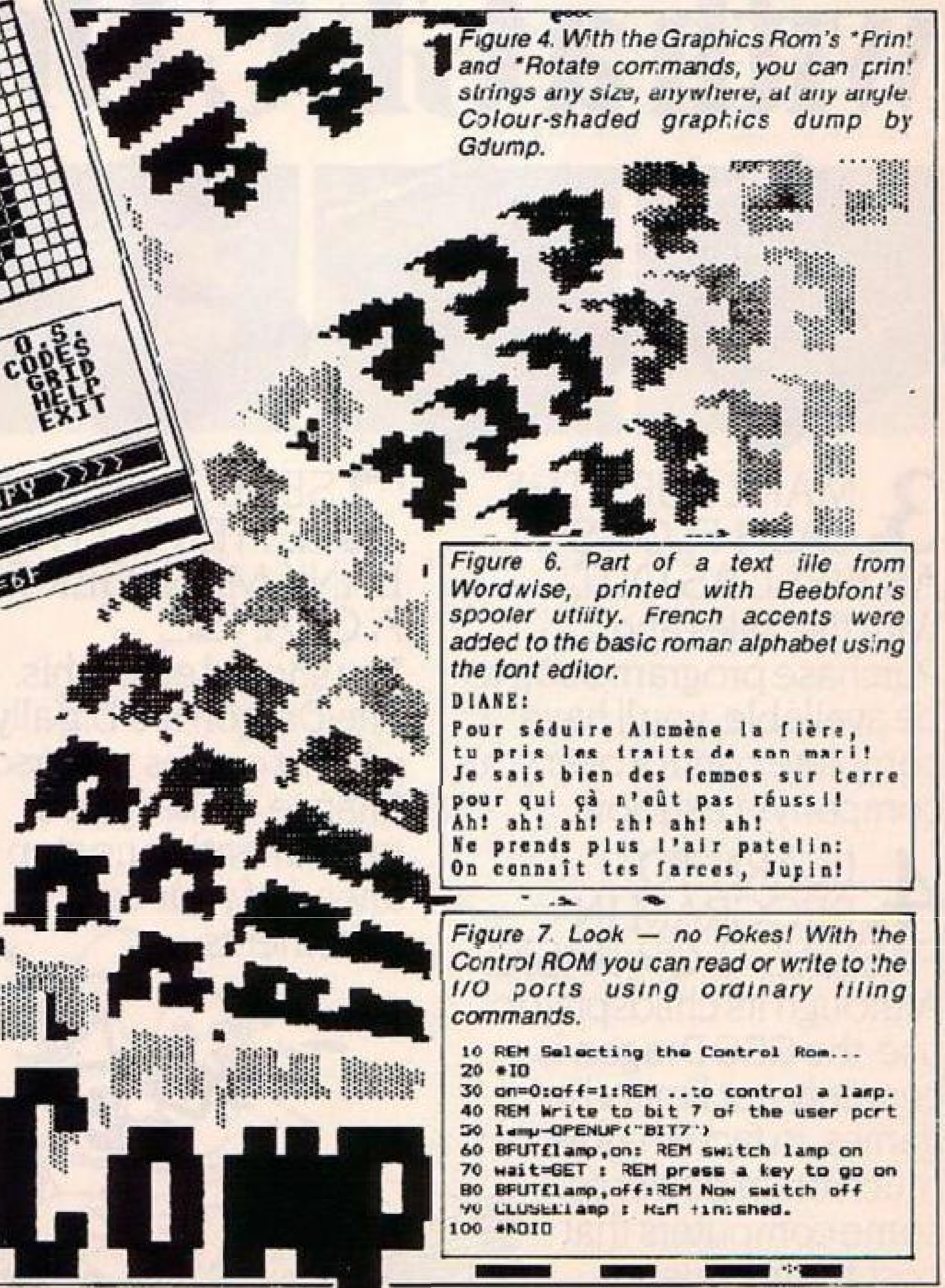



*Figure 4. With the Graphics Rom's *Print and *Rotate commands, you can print strings any size, anywhere, at any angle. Colour-shaded graphics dump by Gdump.*

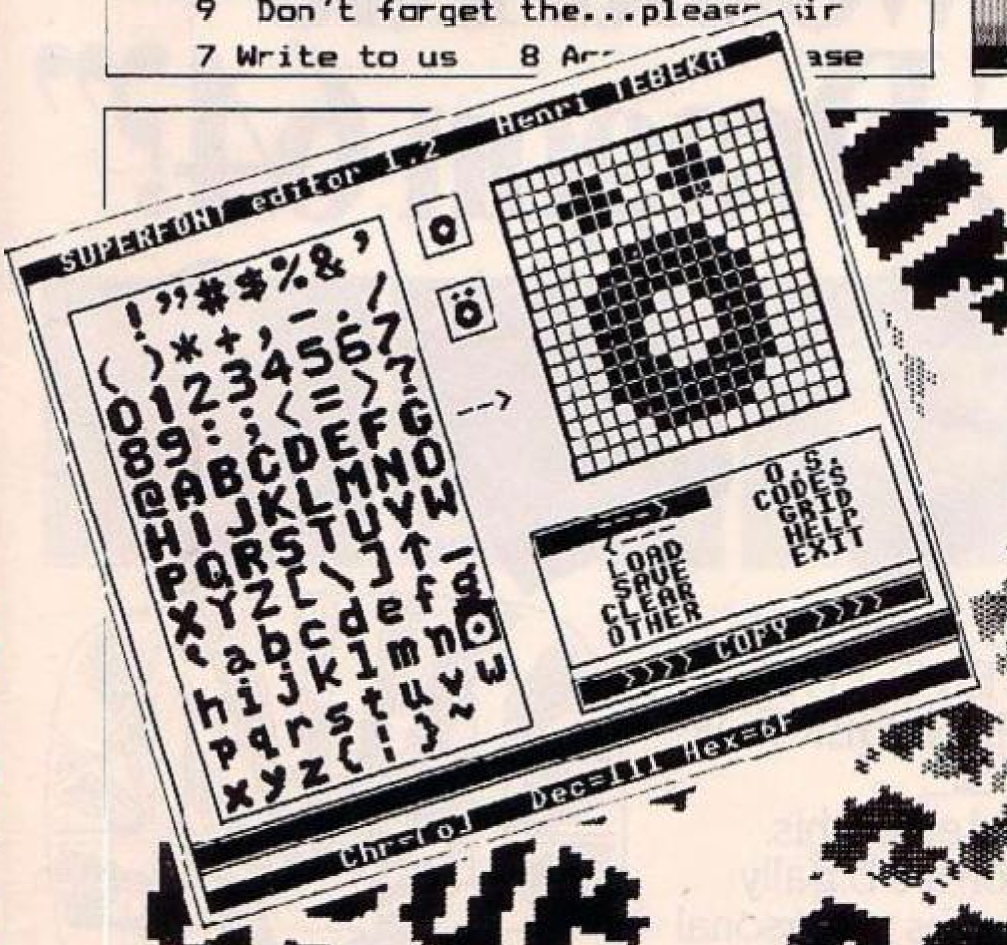



*Figure 5. This font editor comes with Watford's Beebfont: it allows you to design you own alphabet or adapt the ones supplied. For comparison, the menu on the right is made up of standard mode 4 characters.*

*Figure 6. Part of a text file from Wordwise, printed with Beebfont's spooler utility. French accents were added to the basic roman alphabet using the font editor.*

DIANE:
Pour séduire Alcmène la fière,
tu pris les traits de son mari!
Je sais bien des femmes sur terre
pour qui çà n'eût pas réussi!
Ah! ah! ah! ah! ah! ah!
Ne prends plus l'air patelin:
On connaît tes farces, Jupin!

*Figure 7. Look — no Pokes! With the Control ROM you can read or write to the I/O ports using ordinary filing commands.*

```
10 REM Selecting the Control Rom...
20 *IO
30 on=0:off=1:REM ..to control a lamp.
40 REM Write to bit 7 of the user port
50 lamp=OPENUP("BIT7")
60 BPUT£lamp,on: REM switch lamp on
70 wait=GET : REM press a key to go on
80 BPUT£lamp,off:REM Now switch off
90 CLOSE£lamp : REM finished.
100 *NOIO
```

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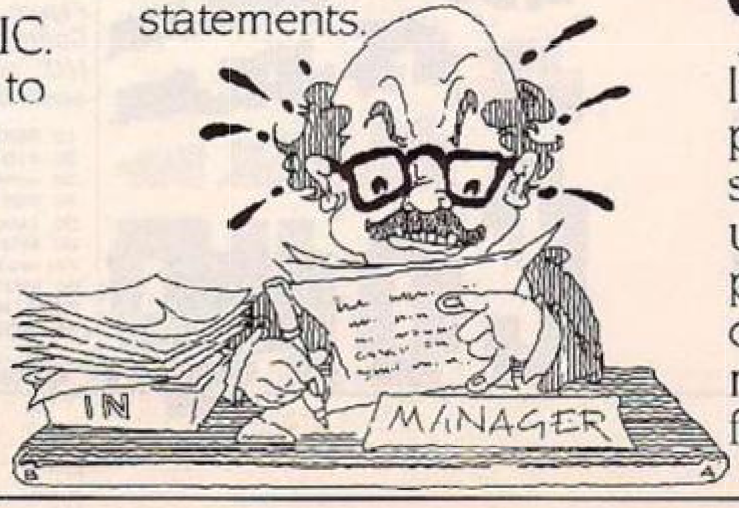
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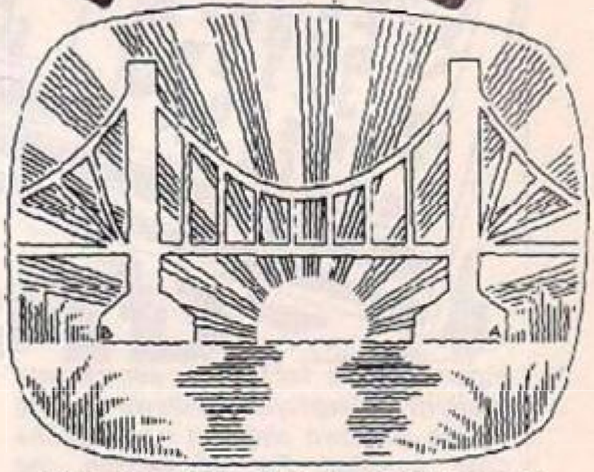



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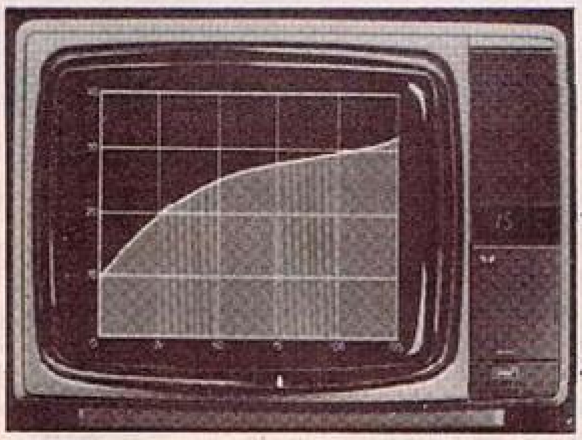
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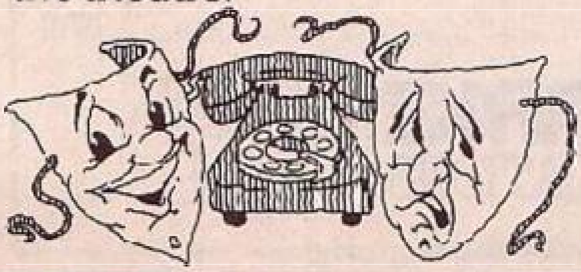






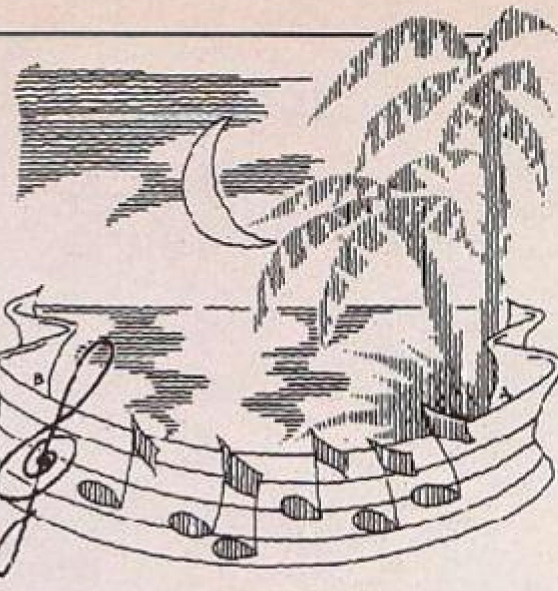

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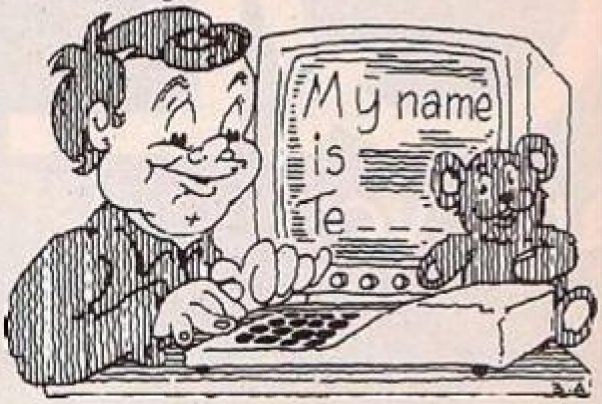


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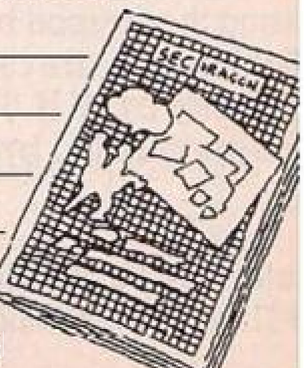
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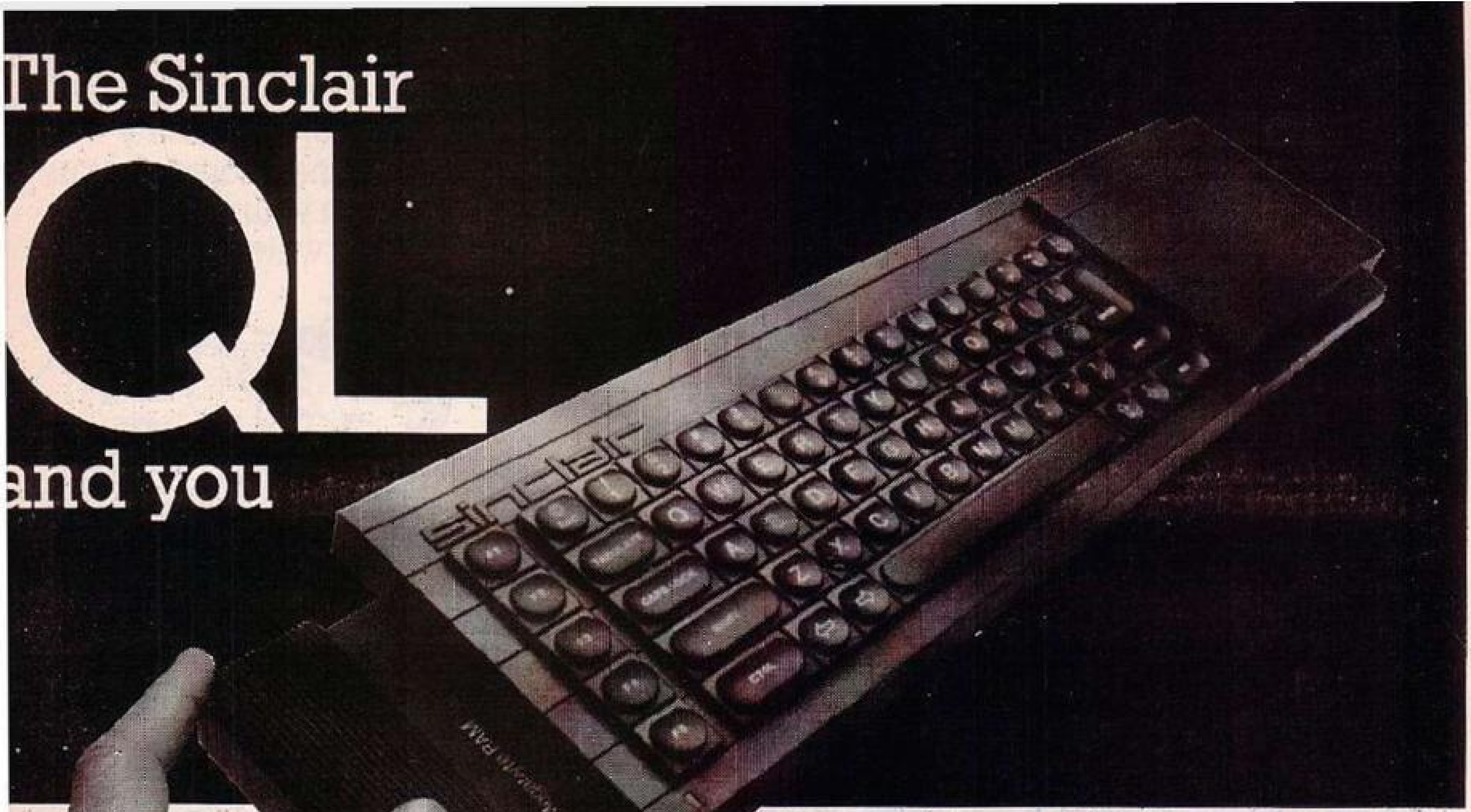
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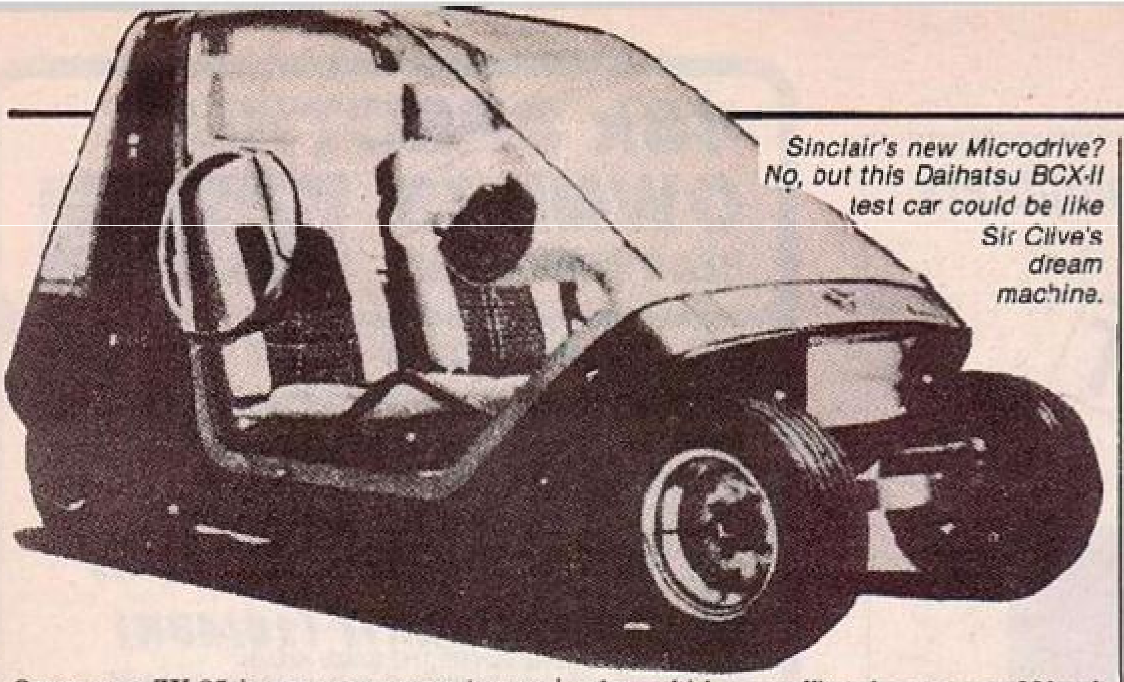
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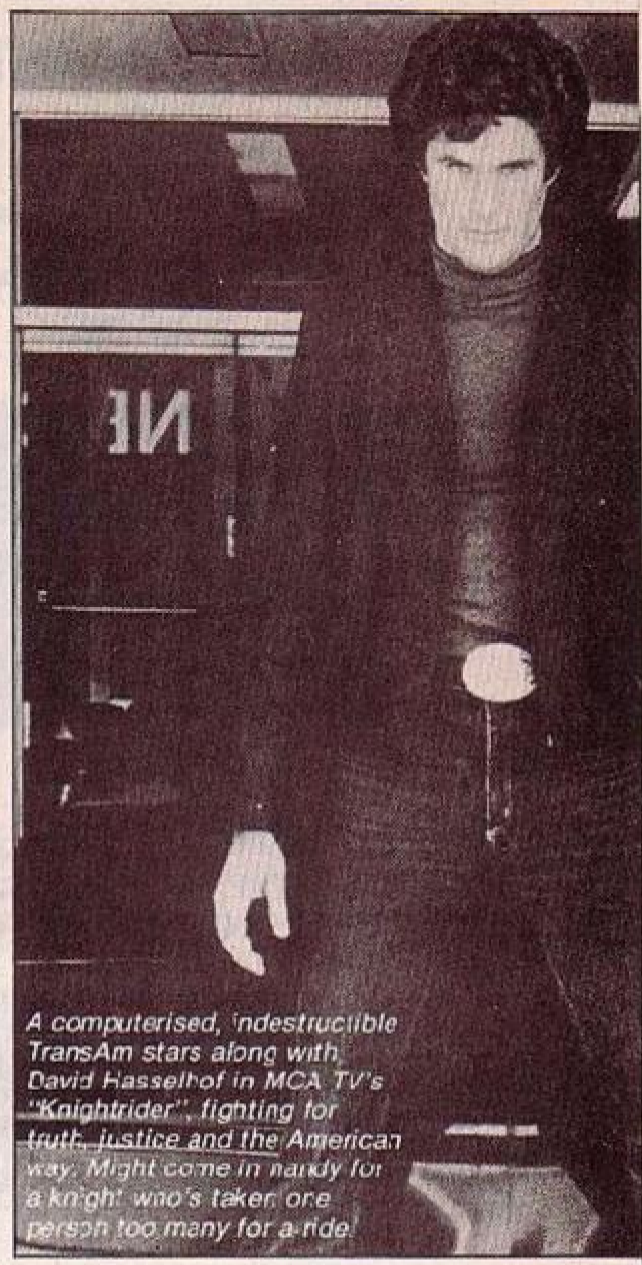
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Sinclair's new Microdrive? No, but this Daihatsu BCX-II test car could be like Sir Clive's dream machine.



A computerised, indestructible TransAm stars along with David Hasselhof in MCA TV's "Knightrider", fighting for truth, justice and the American way. Might come in handy for a knight who's taken one person too many for a ride.

SINCLAIR'S ZX-85 is not a computer but an electric car — symbolising the fusion of micro and motor technologies.

Sir Clive believes that computer cars will be part of a golden age which micros are driving us to. "I anticipate totally automatic personal vehicles still with all the freedom in space and time of today's cars," he said earlier this year, "but guided by artificial intelligence. They need not then be restricted to 55mph or 70mph on main roads. Speeds of over 200mph should be safely and economically possible."

His Sinclair Vehicle Project is committed to producing a low-cost town runabout to be launched next spring. SVP's Managing Director Barrie Wills acted as chief executive of De Lorean Motors when its colourful founder John Z De Lorean found himself on the wrong side of a video camera allegedly discussing cocaine smuggling.

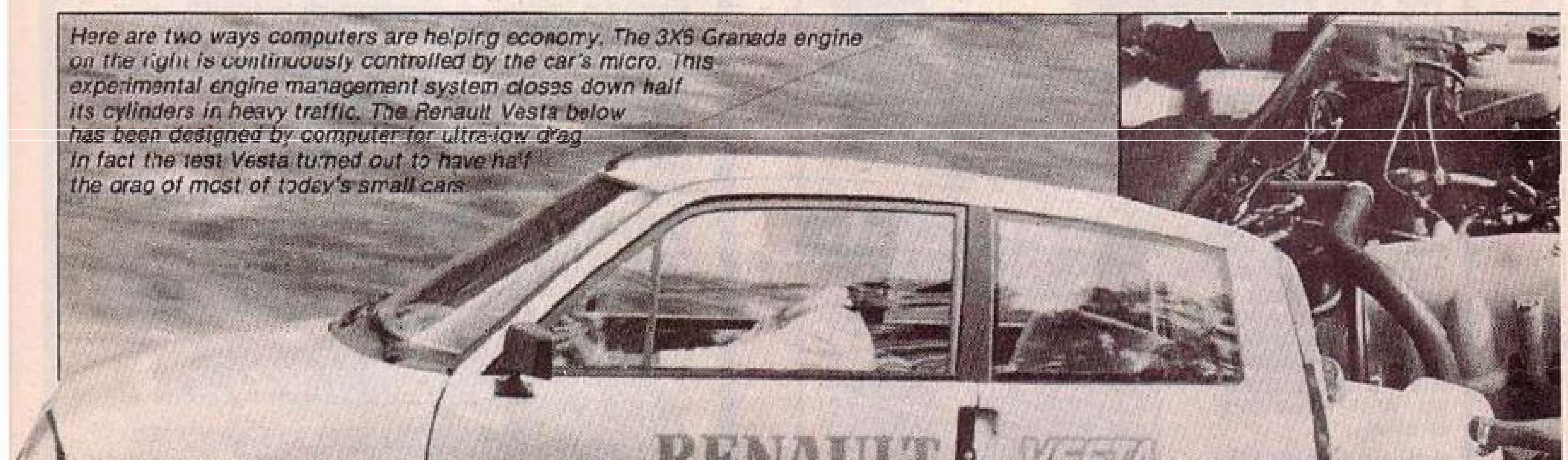
But despite Barrie Wills' experience with high-speed cars and Sinclair's enthusiasm for robot vehicles patrolling the streets at 200mph the ZX-85 will be much less ambitious.

The first vehicle, which will be produced at the Hoover plant in Merthyr Tydfil, South Wales, is a cross between a motorbike and a car, a lightweight three-wheeler which is already being tested in prototype form.

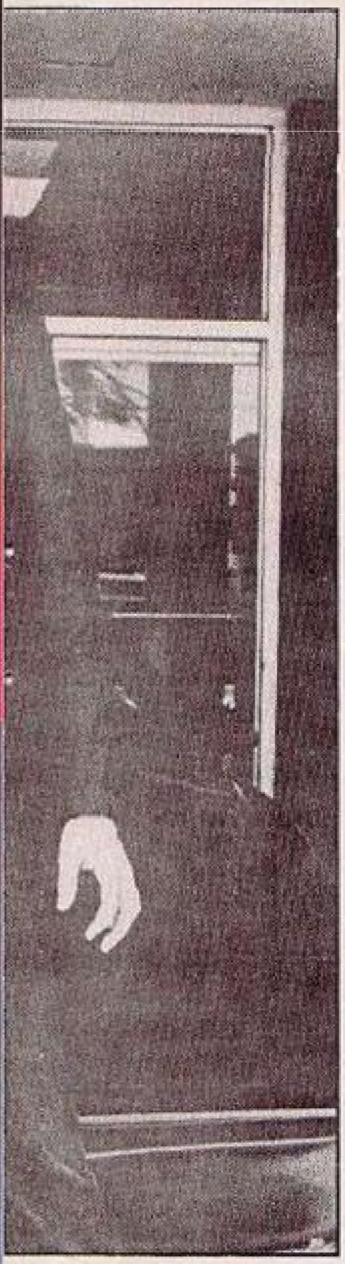
Later Sinclair hopes to build up to a whole family of four-wheeler cars and perhaps light vans. If he achieves the level of production which our sources suggest he is aiming for — 100,000 vehicles in the first year — he will become a major force in the British motor industry almost overnight.

Although Sir Clive began thinking about electric vehicles 10 years ago, development began only in 1981. Little is known about his first machine but it is a safe bet that it will take full advantage of microchip-based gimmicks which cost little to install but substantially increase the price you can charge for a glorified tricycle.

# BREAKING O




Here are two ways computers are helping economy. The 3X6 Granada engine on the right is continuously controlled by the car's micro. This experimental engine management system closes down half its cylinders in heavy traffic. The Renault Vesta below has been designed by computer for ultra-low drag. In fact the test Vesta turned out to have half the drag of most of today's small cars.



SATELLITE NAVIGATION was only one of the wackier innovations in Ford's Continental Concept 100 show car, below right, which demonstrated some of the future uses of micros in cars. Although Ford's future — don't be fooled by its early 1960s "Thunderbirds are Go" styling — car is only just over a year old it has already been superseded in many respects.

It uses keyless entry — a remote control infra-red beam replaces the key — but this year the Renault 25 was launched with that as a standard feature. The crude voice synthesiser incorporated in the Concept 100 has been bettered by the production units in cars like the Austin Rover Montego, Maestro and the new Renaults.

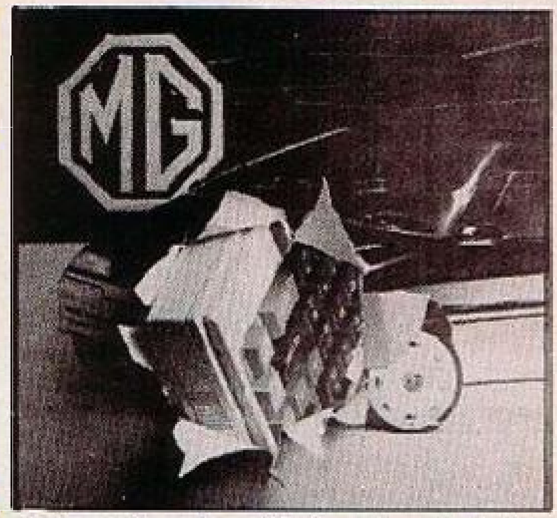
Voice commands which allow you to shout "Mainbeam on", "Raise aerial" or "Wipers on" once you have trained the system to identify these commands has not so far been imitated on production cars. Neither has the sonar detection system which is supposed to help you park without hitting the vehicles around you. But the array of LCD warnings of low fuel, open doors and system failures are now becoming commonplace.

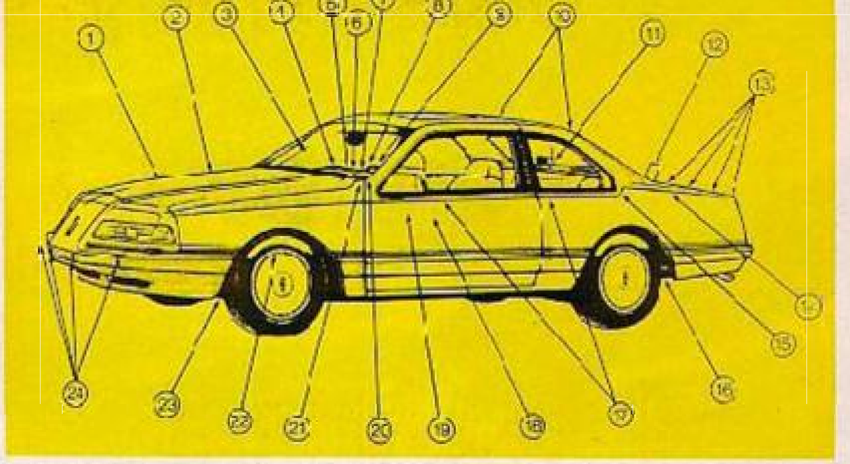
The most extravagant use of a micro in the Concept is for processing signals from the aerial on the boot which receives positional information from a satellite in earth orbit.

The satellite will tell you where you are to within 400 yards — not much use in central London but helpful for your occasional forays into the Sahara during a sandstorm. Several Japanese companies are working on more practical guidance systems which use loops in the road to emit signals to a car-based micro which allows it to display where you are on a scrolling map built into the dashboard.

**Continental Concept 100.**

1. Electronic fuel injection
2. Electronic engine control (EEC-IV)
3. Heated windshield
4. Front sonar detection display
5. Interactive CRT display with satellite navigation
6. Voice command
7. Voice alert
8. Keyless ignition
9. Liquid crystal instrument cluster
10. Electroluminescent high-mount brake lamps
11. Rear sonar detection display
12. Satellite antenna
13. Rear sonar sensors
14. Remote convenience system
15. Rear Intellivision game
16. Electronic air suspension
17. Front/rear radio controls
18. Keyless entry
19. Programmable seats
20. Warning module
21. Electroluminescent interior lighting
22. Low tyre pressure transmitter
23. Four wheel anti-skid brakes
24. Front sonar sensors



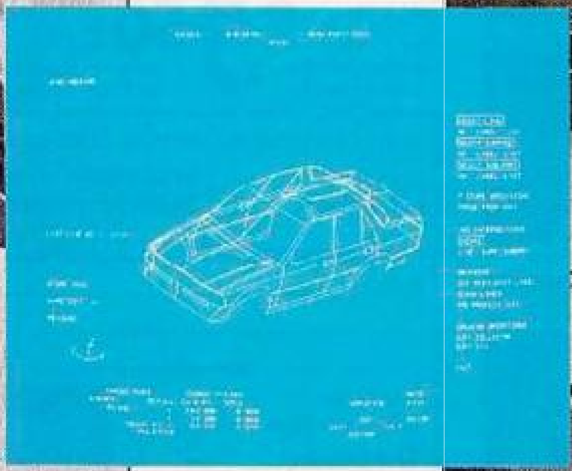


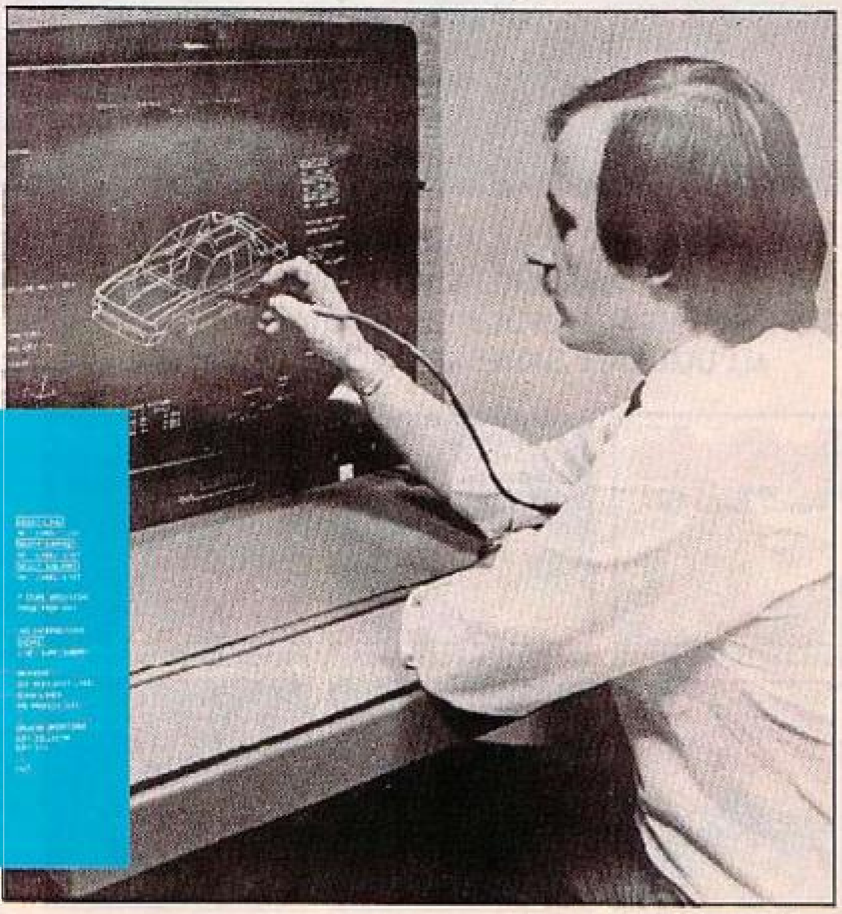
It's clunk-click every trip as *Your Computer* goes on the road to look at how micros are getting into motoring

# N THROUGH



*Ford has been using computers to help it design cars for the last 20 years. Today's micros can run computer-aided design packages more powerful than those Ford used on mainframes to formulate whole cars two decades ago.*








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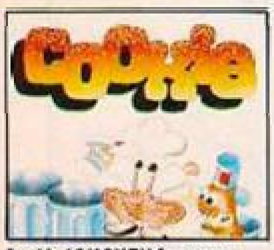
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Atic Atac 48K ZX Spectrum



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- [ ] Lunar Jetman
- [ ] Pssst
- [ ] Tranz Am
- [ ] Jet Pac
- [ ] Jet Pac – Expanded VIC 20
- [ ] Atic Atac

I enclose cheque/PO for £____ Name____

Address____

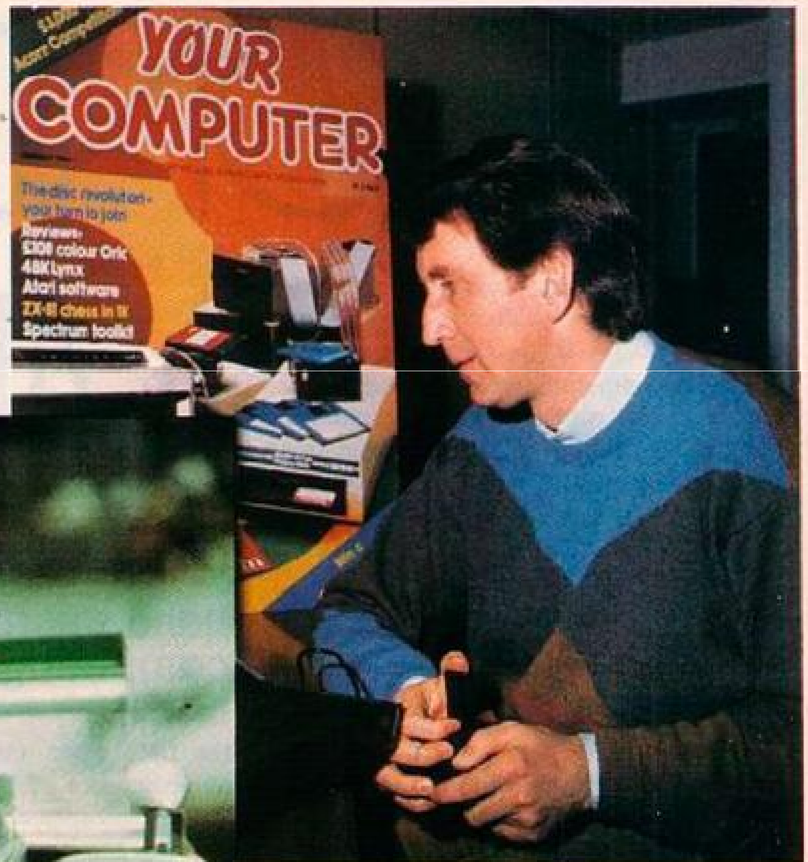
Code____

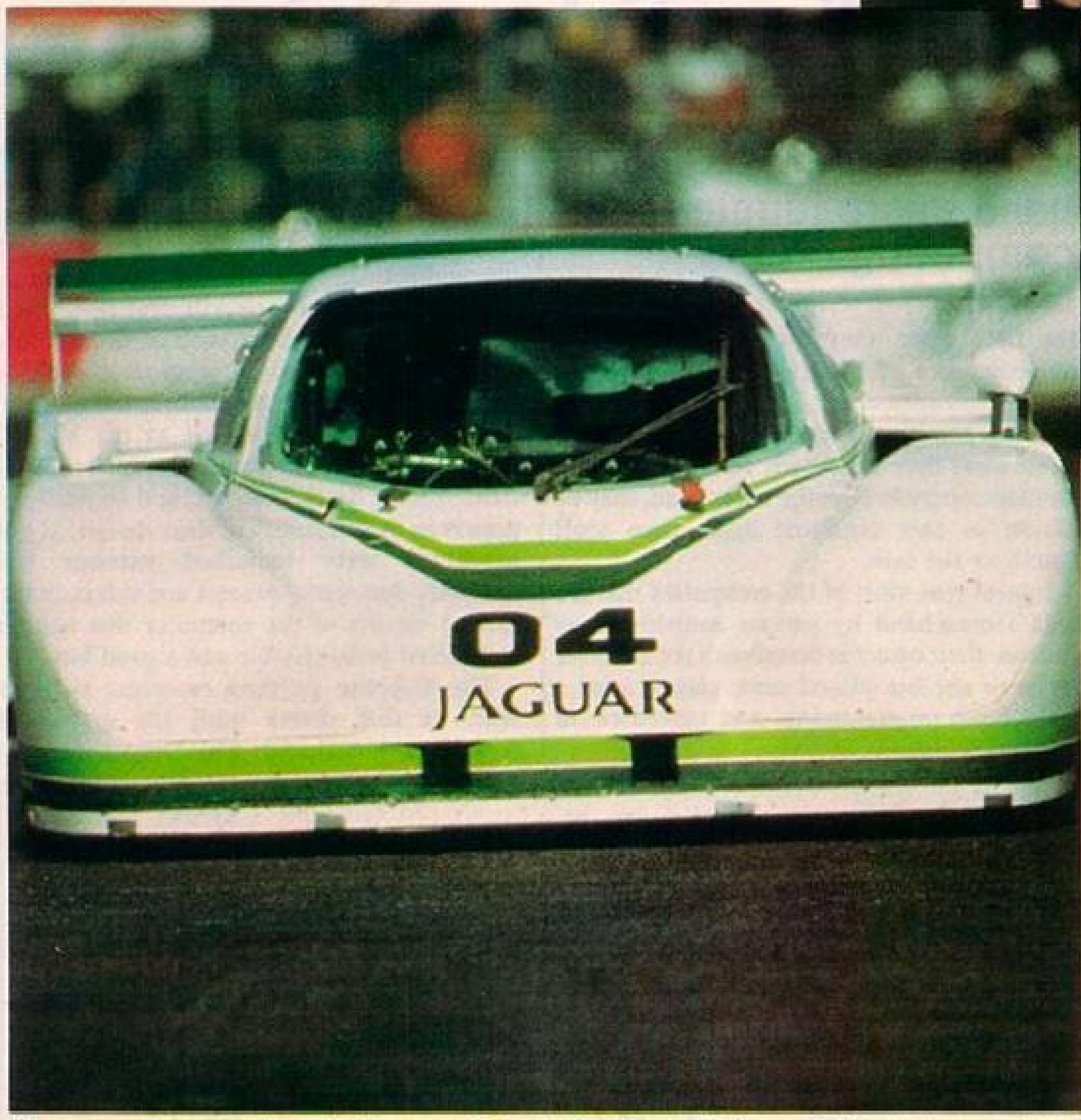
Send to:
Ultimate Play The Game,
The Green,
Ashby de la Zouch,
Leicestershire.

ULTIMATE PLAY THE GAME

Ultimate Play The Game is a trade name of Ashby Computers and Graphics Ltd., The Green, Ashby de la Zouch, Leicestershire, Tel (0530) 411485. Dealer enquiries welcome.

# WATSON'S WORDS




*Above: John Watson at the controls — "Whoops. Do people actually enjoy these things?". Left: A Jaguar XJR5 similar to that which John Watson drove at Le Mans.*

**John Watson, Formula One driver tries out some motor racing games. But he'll be sticking to the real thing**

WHEN TOP BRITISH Formula One star John Watson found himself without a car for this year's Grand Prix we tried to convince him to give up four wheels for the security of an armchair and take up computer motor racing games instead.

We failed — as his decision to spearhead Jaguar's return to endurance sports car racing at the Les Mans 24 hour shows — but we did get him to trade in his steering wheel for a joystick for an afternoon.

Surprisingly, although Watson has been racing cars for over 20 years and has appeared in adverts for Activision video games he had never laid hands on a home computer or even played an arcade game. For all his skill on the track he found Atari's Pole Position far from elementary.

Watson scooted up the first straight of the Atari Malibu Grand Prix in practice trying to set a fast qualifying time and gain pole position for the race but found himself on the grass at the first corner. "Whoops. Do people actually enjoy these things? I've never done one of these before in my life".

At first John Watson merely poured scorn on computer games and all who play them every time he crashed a car. "This is the sort of thing that would appeal to Andrea very much" he said contemptuously. Andrea De Cesaris who now drives for Ligier was one of his rivals last season — "he's got that sort of mentality".

After a whole series of shunts and unscheduled picnics on the grass around the track he finally found his way back to the start — but was shocked to find that he had not qualified for the race. "What's happened, I've stopped now". He took a more serious attitude: "Well I'll just have to try again then".

He cradled the joystick in his hands and concentrated for a few more unsuccessful laps before admitting "these things are addictive in a way. I can see that if you do have a machine that you can get involved in it. I'm useless at it though".

Trying out other race circuit games in the hope that he would be able to master one of them immediately Watson made some cogent criticisms of the controls.

He was not worried by the deficiencies of the pictures on screen. Low resolution and a view from behind your car rather than out of the cockpit were no problem.

"Where it fails for me is sensitivity. I would like to have some controls that move and are more obedient and responsive."

Watson is not impressed by the simple on/off switches used in joysticks. "If only they could make them more responsive. There's no feeling or gradation. You need something like a rheostat, something more progressive. The area where it needs to be improved, for me at least, is in the reaction to the controls. It doesn't react quickly enough for me."

As for keyboard controlled games Watson was not even prepared to consider them. "You're joking" was his reaction to the multifingered requirements of Psion's Chequered Flag.

Games like Micromega's 3D Deathchase which add a shoot-em-up element to racing — motorbikes in this case — did not appeal to John Watson at all.

He seemed determined that his first encounter with computer games would also be his last. "As they go on they're going to get more sophisticated. But this for me is terrible. There's no pleasure at all for me."

Perhaps Watson will change his mind after his showing at Le Mans this year. There he dropped out.

# SECOND-HAND MICROS

WHERE DO OLD computers go to? Are they like elephants and soldiers — fading away without trace — or is there somewhere a municipal computer disposal squad? If you want a cheap computer, is a second-hand machine a good buy? What goes wrong with computers anyway — why don't they go on forever?

These diffuse ideas seem to boil down to four hard questions:

- Where do second-hand computers come from?
- Will a second-hand computer work as a whole or will it be fit only for spare parts?
- Are instruction manuals available and will the machine work without needing an electronic Sherlock Holmes?
- How much do they cost?

There is an increasingly large turnover of microcomputers in commerce and industry and these machines will become available as they are sold second-hand by commercial users. Good commercial advice at present is to write-off a microcomputer over two years.

At the same time as many companies are applying the laws of economics to the hardware they use, many universities are trying to squeeze as much use as possible out of their computers; using the machines past

**John Dawson guides you through the second-hand micro jungle for computing on the cheap.**

the time when they become commercially non-cost effective and relying on University staff for maintenance.

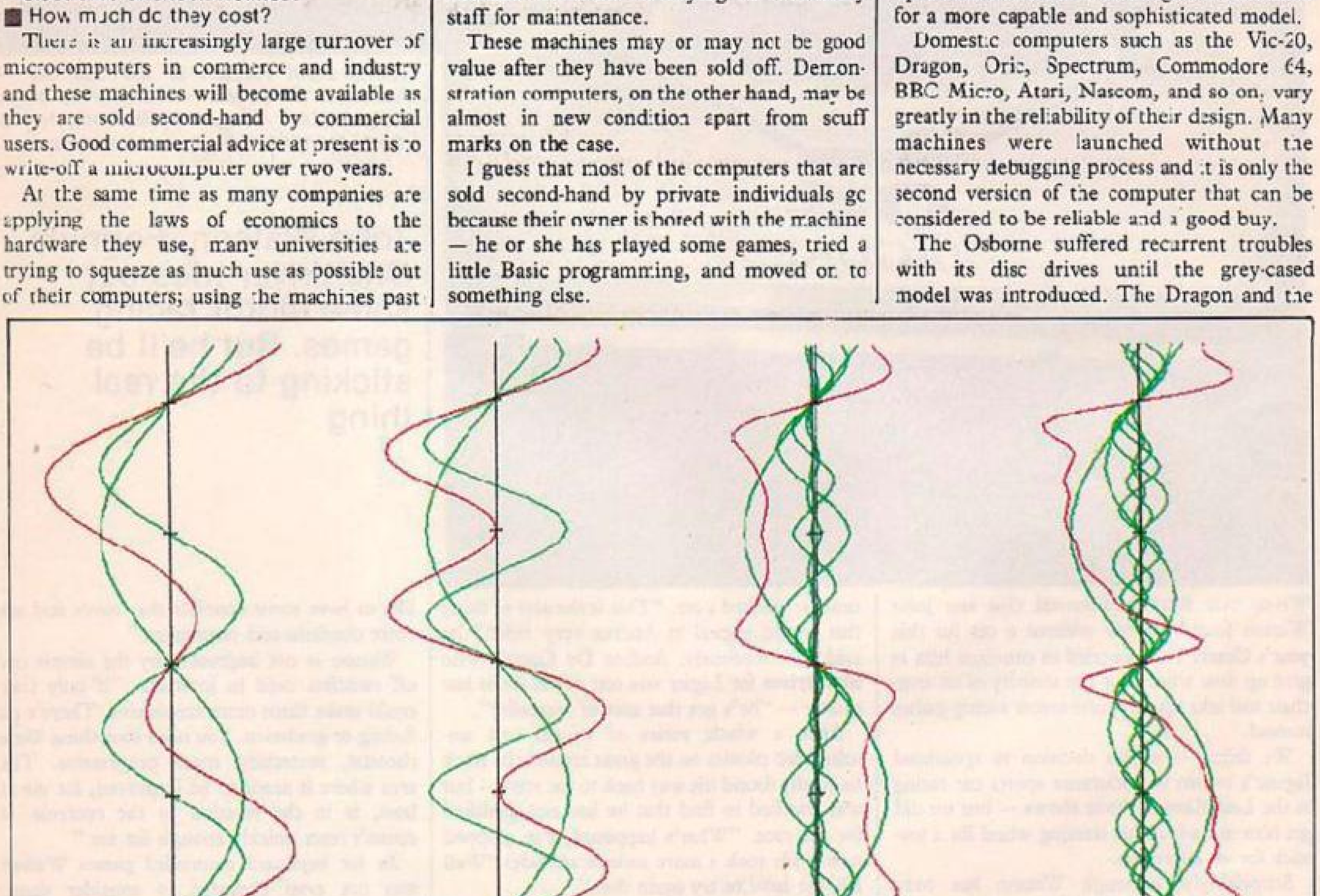
These machines may or may not be good value after they have been sold off. Demonstration computers, on the other hand, may be almost in new condition apart from scuff marks on the case.

I guess that most of the computers that are sold second-hand by private individuals go because their owner is bored with the machine — he or she has played some games, tried a little Basic programming, and moved on to something else.

The reason maybe simply that they did not appreciate that the Basic coding is the least important part of using a computer successfully — it is the analysis, the understanding of the problem that matters. In contrast, some people selling computers will have discovered the limits of a machine such as the Sinclair Spectrum and wish to exchange their machine for a more capable and sophisticated model.

Domestic computers such as the Vic-20, Dragon, Oric, Spectrum, Commodore 64, BBC Micro, Atari, Nascom, and so on, vary greatly in the reliability of their design. Many machines were launched without the necessary debugging process and it is only the second version of the computer that can be considered to be reliable and a good buy.

The Osborne suffered recurrent troubles with its disc drives until the grey-cased model was introduced. The Dragon and the






```
10:REM WAVE SYNTH
   ESIS
50:DIM K(10)
90:ON ERROR GOTO
   100
100:CLS :WAIT 0:F0
   =0
110:PRINT "Enter A
   H S or Q ";
120:A$="":A$=
   INKEY$ :IF A$=
   ""THEN 120
130:IF A$="Q"THEN
   END
140:GOSUB A$
150:GOTO 100
1000:"H":CLS
1010:PAUSE "Enter
   harmonic co
   mponents"
1015:GOSUB 10000
1020:FOR V=2TO 10
1030:CLS :PRINT "
   Enter h";
   STR$ (V);" %
   ";
1035:INPUT " ";K(
   V)
1040:NEXT V
1050:RETURN
2000:"A":CLS
2010:PAUSE "Draw
   axes"
2030:GRAPH :COLOR
   0
2050:GLCURSOR (10
   5,-400)
2060:SORGN :LINE
   (-105,0)-(10
   5,0)
2070:GLCURSOR (0,
   0)
2080:LINE -(0,420
   )
2090:FOR L=360TO
   0STEP -90
2100:LINE (-5,L)-
   (5,L)
2110:NEXT L
2120:GLCURSOR (0,
   0)
2130:LINE (-50,-6
   )-(-50,0)
2140:LINE (50,-6)
   -(50,0)
2300:F0=1:RETURN
5000:"S"
5010:IF F0=0THEN
   GOSUB "A"
5020:COLOR 2
5030:GLCURSOR (0,
   0)
5040:FOR G=0TO 40
   0STEP 5
5050:LINE -(50*
   SIN G,G)
5060:NEXT G
5070:GLCURSOR (0,
   0)
5100:FOR V=2TO 10
5105:IF K(V)=0
   THEN 5200
5107:A=K(V)/100
5110:FOR G=0TO 40
   0STEP 5
5120:LINE -(50*A*
   SIN (V*G),G)
5130:NEXT G
5135:GLCURSOR (0,
   0)
5200:NEXT V
5210:CLS :PAUSE "
   Sum of harmo
   nics"
5220:COLOR 3
5230:FOR G=0TO 40
   0STEP 5
5235:A=0
5240:FOR V=2TO 10
5250:J=50*(K(V)/1
   00)*SIN (V*G
   )
5252:A=A+J
5254:NEXT V
5258:A=A+50*SIN G
5260:LINE -(A,G)
5270:NEXT G
5290:GLCURSOR (0,
   0)
5292:GOSUB "M"
5294:RETURN
5300:"M"
5302:TEXT :LF 2:
   COLOR 0
5305:LPRINT "Harm
   onics "
5310:FOR V=2TO 10
5320:LPRINT USING
   "###";" h";V
   ;
5325:LPRINT USING
   "######";K(V
   );" %"
5330:NEXT V
5340:LF 3
5350:RETURN
10000:"Z":CLS
10010:FOR V=0TO 10
10020:K(V)=0
10030:NEXT V
10040:RETURN
```

Oric had their troubles and even the august Apple II suffers from overheating in some circumstances. Despite this, the integrated circuits used in all of these computers are reasonably stable and reliable.

Provided you acquire the machine after the first short "burning-in" period, you can expect several years of trouble-free operation. After this time the probability of failure rises again owing to thinning of the micro-connections inside the integrated circuit — electro-migration — and breaks in the seal around the leads into the IC allowing water vapour to eneter and corrode the chip connections.

Commercial mainframe computer operators expect about seven years operation before the rate of maintenance call-out becomes uneconomic. So, if you can pick up a micro-computer which was originally well designed, a couple of years into its life span, you can expect good value for your money as far as the chips are concerned.

The most fragile components of any micro-computer are the electro-mechanical devices such as the keyboard, disc drives, printer and built-in tape cassette deck. The high voltages associated with the cathode ray tube in the visual display unit may also give trouble and "burning" of the screen is a common problem in ex-commercial VDUs.

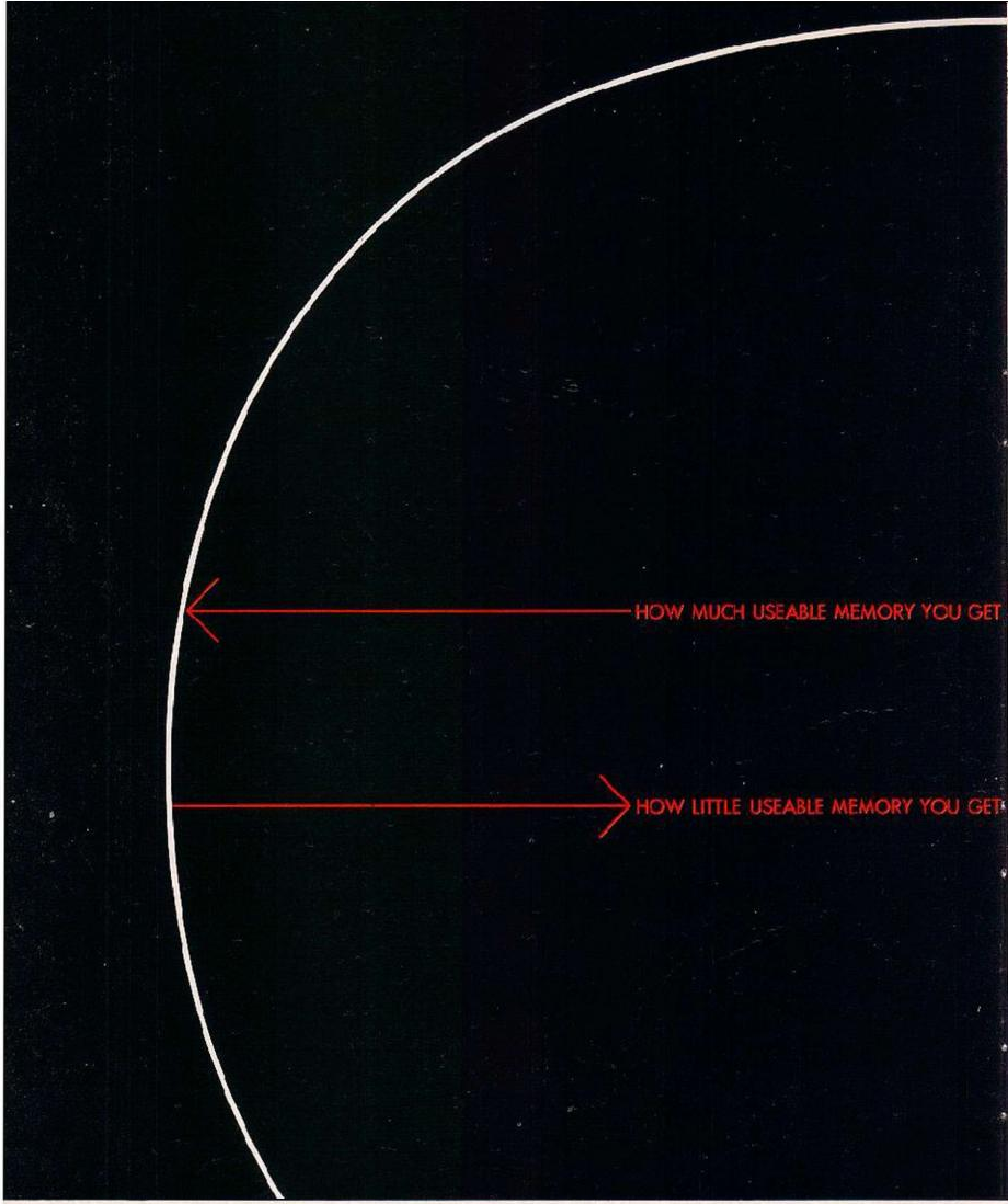
My Apple computer has been used now to write two books, each of 60,000 to 70,000 words, and any number of articles. If there are six characters in each word on average and if each book required 20 percent more typing than the final text, then the keyboard has handled at least 935,000 keystrokes and I expect that the articles have brought the total up to a round million.

There is still no sign of bounce or missed keystrokes in the Apple keyboard — obviously a reasonably rugged and well designed component.

My Epson printer has printed both the books and many articles several times as they progressed through one draft stage after another. The printer seems fine after several million characters — a remarkable piece of engineering.

Clearly you should not expect this kind of life from a computer and its peripherals at the cheap end of the domestic range. If one or two of the keys are used heavily for playing games, for example, then the keyboard may fail earlier than you would otherwise expect.

*(continued on page 75)*




Like humans, computers have memories.

Unlike humans, their memories shrink when they work.

Simple functions like colour, sound, text and high resolution graphics use up large amounts of memory, leaving little for you to play with.

For example, the Commodore claims an "elephantine" 64K memory, yet loses 26K in high resolution graphics.

Under the same conditions, the Dragon 32K leaves 24K of useable memory, the Lynx just 14K.

And the Acorn Electron and BBC Micro leave a miserly 9K to play with.

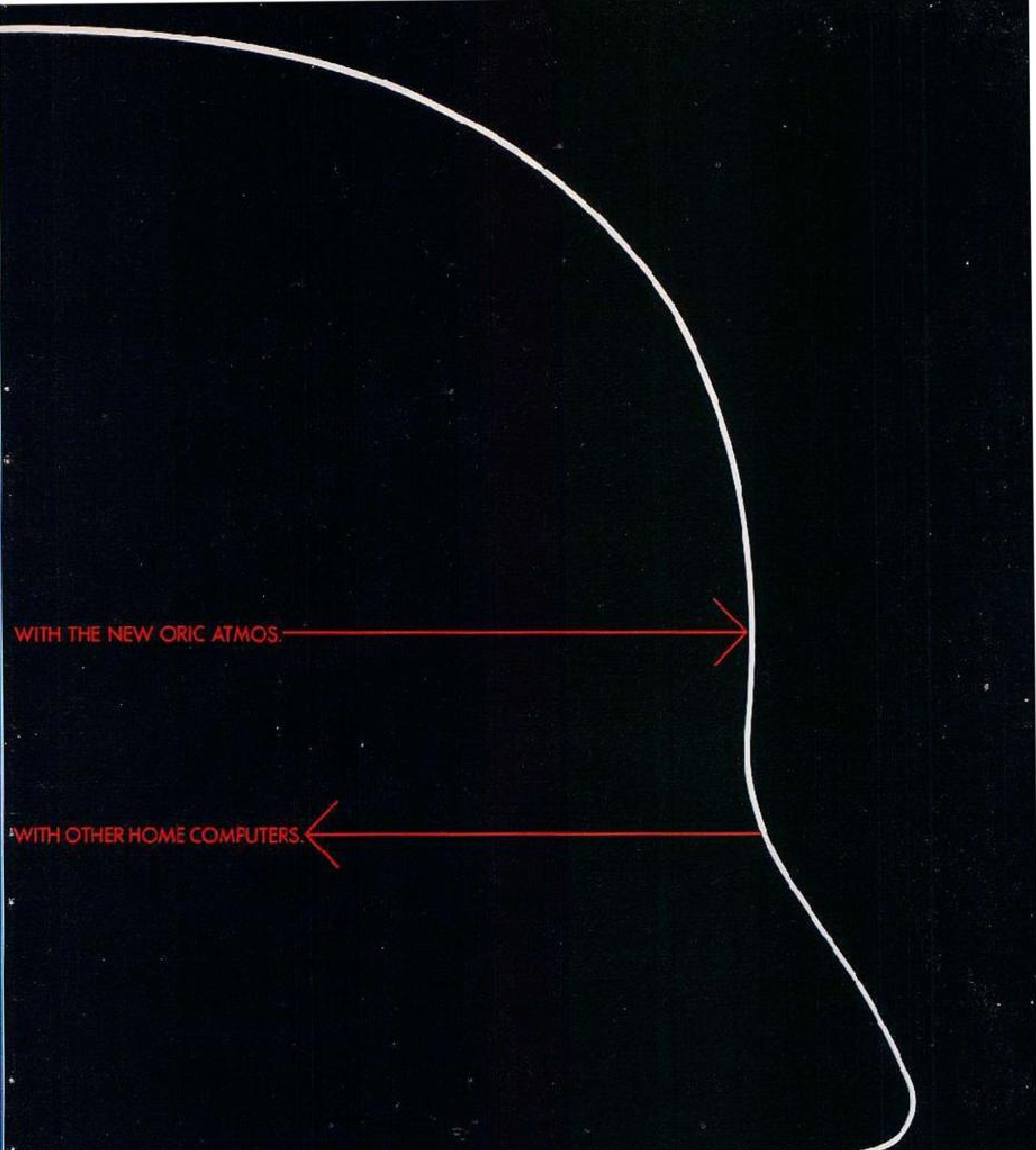
However, there's one computer specifically designed to take all these working functions in its stride.

The Oric Atmos 48K.

Even when you plug in its sleek, new, matching four-colour printer and micro disk drive unit, its useable memory is never less than a healthy 37K.

So once you've mastered the basic techniques,

AVAILABLE AT ALLDERS, CURRYS, DIXONS, GREENS, HARRODS, LASKYS,




you'll have plenty of memory to expand into advanced programming and extremely sophisticated games.

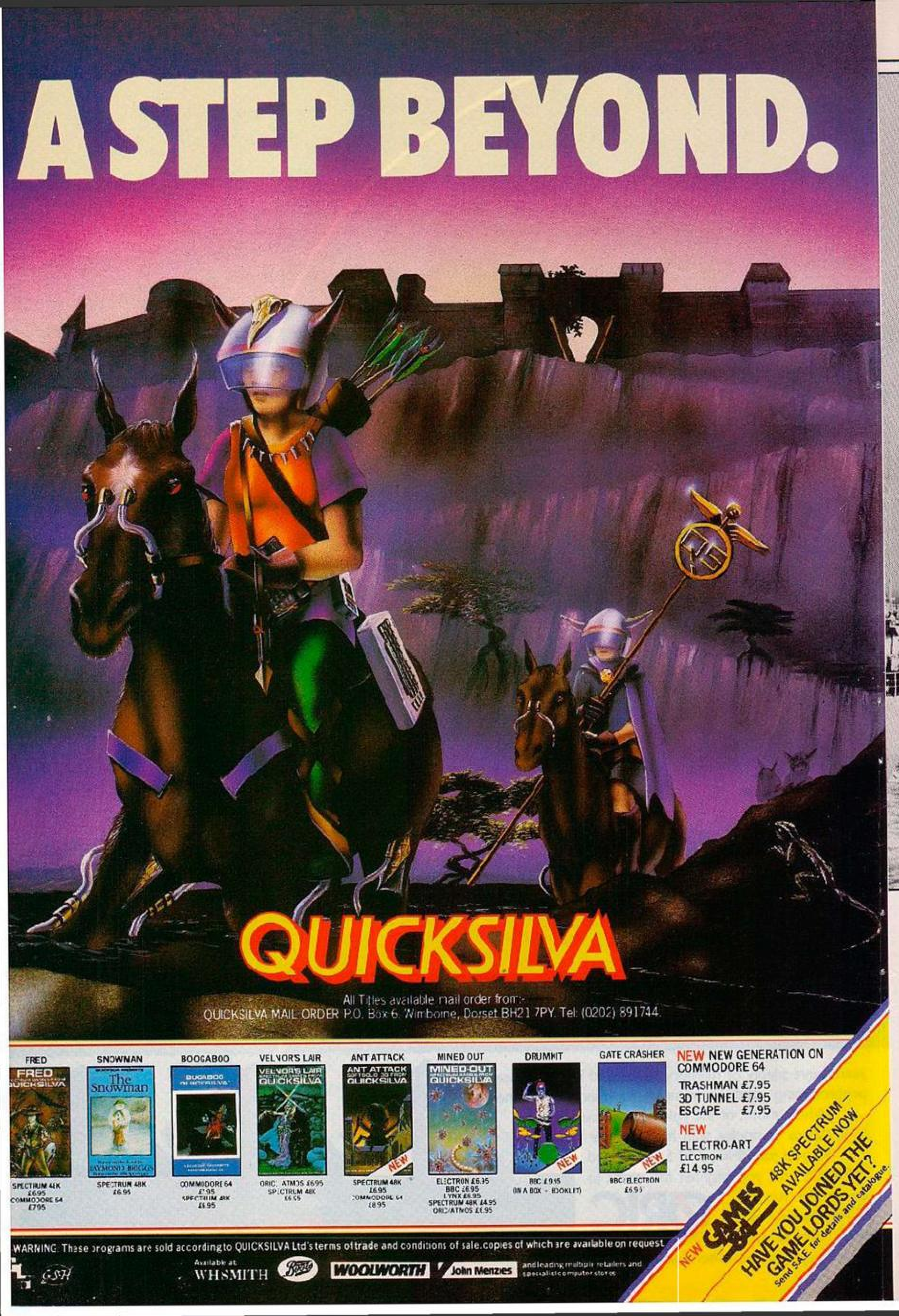
What's more, at full volume, the sound on the Oric Atmos competes with most arcade games.

So you can PING, ZAP, SHOOT and EXPLODE until you frighten the aliens to death. All for just £170, including all the leads and adaptors.

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(continued from page 71)

Assuming that you decide to chance the state of wear of some second-hand equipment, where would you go to buy? Well, most of the computer and electronic magazines have a classified advertisement section but that always seems a little dangerous to me.

If you are sure that you can spot faults and find an honest seller then good luck. But remember that some faults show up only when the computer has been running for some time; others are intermittent and may occur only in certain combination of circumstances.

As an alternative to buying privately, there are a number of shops selling used computers; either domestic or commercial machines. The Morgan Camera Company, for example, is in Tottenham Court Road, London — 01-388 2562 and from dealing in used cameras, the shop has expanded into buying and selling second-hand computers.

The current second-hand list is displayed on a blackboard outside the shop and there is a separate list inside for new and ex-demonstration computer equipment.

The people running the Morgan Camera Company say that they could sell far more computer equipment than they are able to buy, even for cash. However, unlike people selling cameras, the people who come to the shop with computers that they wish to sell often have unrealistic expectations of the price it will fetch.

## Second-hand prices

The shop expects to add 30 percent to the buying-in price and 15 percent VAT has to be added to that before the final figure is reached. In return for the 30 percent mark up, the shop checks that the machine is operating correctly, more necessary in some machines than others, and then guarantees the equipment for 30 days after the sale.

Some machines hold their value much better than others. A BBC model B, for example, can sell for £325 including VAT — new price £399 — while the Jupiter Ace can be had for as little as £15.

Other prices which are more or less typical are:

| | |
|---|---|
| Commodore 64 | £139 |
| Acorn Atom | £40 |
| Lynx | £115 |
| Dragon | £65 |
| Newbrain A | £103 |
| Newbrain AD | £110 |
| Spectrum | £99 |
| Epson HX-20 with Microdrive | £325 |
| PC-1500 | £65 |
| with printer and cassette unit | £75 |

Other companies deal in minicomputers such as the DEC range and more sophisticated peripheral devices. For example, Electronic Brokers Ltd, in Kings Cross Road, London — 01-833 1166 — carries a wide range of DEC central-processor units, memories and input/output devices. The DEC systems sold by Electronic Brokers are reconditioned and tend to cost a lot of money. Nevertheless, they offer enormous computing power at comparatively low prices.

Display Electronics, Biggin Way, Upper Norwood, London — 01-679 4414 — also carries a wide range of surplus commercial computing equipment. Provided that you know how to connect it to your own machine, you might find good value, for example, in a Termiprinter, a 30-character per second, 120-column RS-232 interface printer, sold untested for less than £100.

P.R. Ralfe Electronics — 01-723 8753 — has offered 8in. Winchester disc drives in the last four months for as little as £250 plus VAT. The drives have a capacity of 19 Megabytes and are said to be brand-new — a remarkable cost/bit ratio — about 69,000 bytes per pound!

The P&R Computer Shop — 0621-57440 — has IBM Golfball printers from £70 plus VAT, but just what state that printer would be in and how much work you would have to do to connect it successfully to your own system is another matter entirely. But if you don't ask, you'll never know.

The instruction manuals are a vital part of any purchase. However poorly written they may be, an instruction manual contains a vast quantity of information that you will find great difficulty in acquiring from anywhere else. The Morgan Camera Co. emphasises that it will only pay a "top" price for a computer if it is complete with the instruction manual.

Books about a computer may well contain new and additional information to that found in the original instruction manual but are unlikely to repeat the boring but essential facts about which pins are connected to what in the printer interface.

Manuals are particularly important if you buy an older piece of equipment such as the Calcomp 565 plotter — Stewart of Reading, 0734-68041. A new A4 flat-bed plotter which will connect directly to an RS-232 interface and has some built-in intelligence might cost between £500 and £2,000.

The Calcomp plotter on the other hand, is a beautifully engineered drum plotter that will maintain its accuracy to +/− one division — 1/100 of an inch — over not only the width of the paper but also the length of the paper roll — 120 feet! The problem, and the reason why the Calcomp 565 can be bought for £165, is that there are only six things that the plotter can do:

- Pen up — pen down
- Carriage left — carriage right
- Drum up — drum down

Additionally the inputs to the plotter are not directly compatible with the usual TTL signal levels on the outputs from modern micro-computers. The Calcomp requires at least 10 volts at 20 mAmps.

The six basic movements are those of any XY plotting system without the high-level character plotting and line-drawing software that you or I would tend now to take for granted. If you know enough to write the software and construct a computer TTL-Calcomp interface, this equipment can be superb value, but you will need a complete instruction manual.

Apart from Osbornes, Apples and Atoms, the Morgan Camera Co. has less mainstream computers at very attractive prices. If you want to do some real Basic computing, the Sharp PC-1500 pocket computer with its four-colour printer/plotter and cassette interface is remarkable value.

This machine fits into part of a briefcase, has a reasonably standard Microsoft Basic interpreter, comes with 3.5 or 11.5 Kbytes of RAM, can handle two-dimensional arrays, and has 18 user-definable keys, a continuous Time statement and all sorts of other useful things.

The printer/plotter uses the same pens as the Oric/Tandy plotter although the paper is somewhat narrower. Programs can be Chained and arrays of data can be saved directly on to tape with a single instruction.

The listing shows a program that synthesises a wave-form from a fundamental frequency and up to 10 harmonics of various amplitudes. The third trace shows how third, fifth, seventh and ninth harmonics can be combined to produce a wave-form that is beginning to like a square wave.

## Good value Atom

By contrast, the fourth trace shows the result of combining even-order harmonics. The Sharp plotter would have produced finer resolution if I had set the Step instruction in lines 5110 and 5230 to one-degree intervals instead of five.

You should be able to reproduce this program on an Oric or a BBC computer keeping the following notes in mind:

GLCursor — 105, − 400 — moves the pen of the plotter to the absolute co-ordinates X = 105 and Y = − 400 without drawing a line.

SCRGN — sets the origin of the plotter to the current coordinates.

Line — − 50, − 6 — − 50,0 — moves to the absolute co-ordinates 50, 6 and draw a line to − 50,0.

Line — A,G — draws a line from the current pen position to the absolute coordinates A,G.

Pause — works like the Print command but waits for a fixed time of about 0.8 seconds. This is useful on the Sharp which has a single line display.

"S", "H" are labels that can be used with Gosub instructions, for example, or with the definable keys to isolate program segments that can be run separately.

LF — line feed. The succeeding number sets the number of line feeds to be sent to the printer.

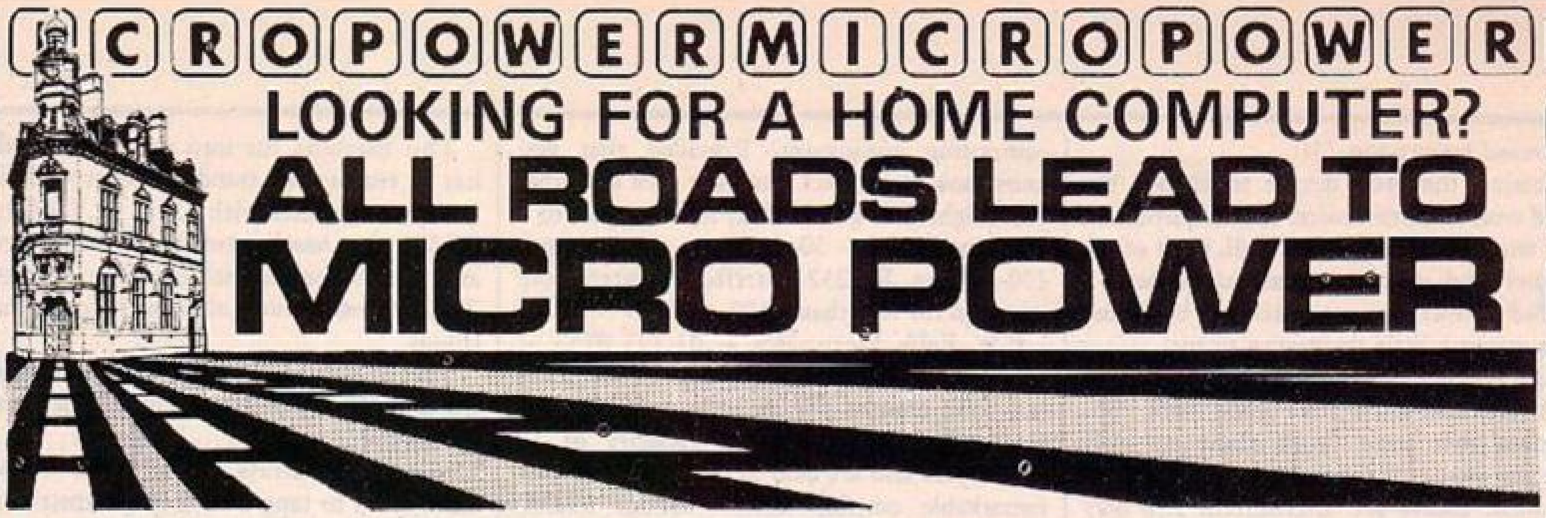
Wait sets the time that the Print instruction will display messages or results on the computer screen.

The Status commands at the end of the program report the number bytes taken by the program, 1, and the remaining space, 0, in the 3.5K configuration.

The Sharp PC-1500 has no Auto or Renumber instructions and no Procedures or Eval function. Nevertheless, it has good error messages, TROn and TROff facilities for tracing program execution and is generally a clean and economical Basic interpreter. It is very usable and the printer/plotter adds both to the fun and the utility of this tiny machine.

Probably the best value of the second-hand computers that I have seen is the Acorn Atom for £40. Expandable, with a fast Basic interpreter, a built-in assembler and a reasonable software base, it is a machine that has simply gone out of fashion.

Consequently, it is less than half the price of a second-hand Spectrum and yet has a real keyboard and far greater potential.



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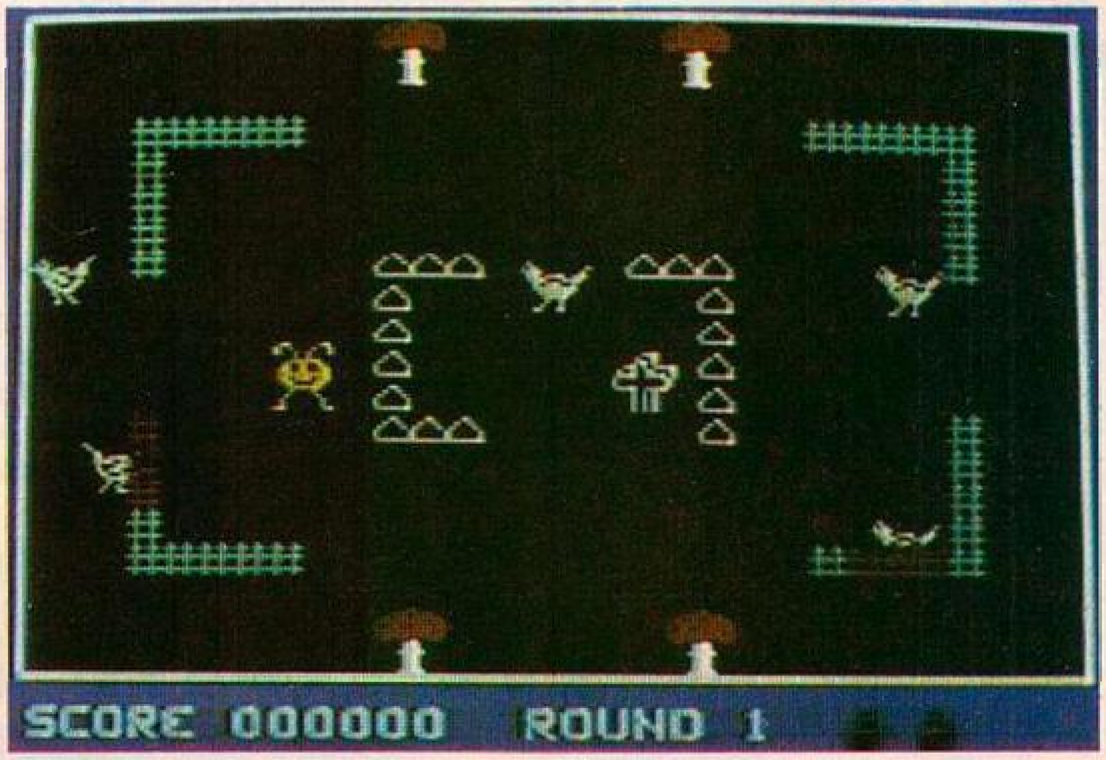

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*Basic "dangerous" listing.*

```
  10 BORDER 1: PAPER 0: INK 7: C
LEAR 28099: PRINT AT 7,7; BRIGHT
 1;"DANGEROUS GARDENS";AT 9,10;"
IS LOADING"
  20 PRINT AT 11,9;"PLEASE WAIT.
": INK 0: LOAD ""CODE
  30 INK 7: DIM a$(5,14): DIM a(
5): DEF FN x(a)=10*INT (a/16)+a-
16*INT (a/16)
  40 LET a(1)=2679: LET a$(1)="J
.Charlesworth": FOR a=2 TO 5: LE
T a$(a)="Anonymous": NEXT a
  50 CLS : LET a=10: PRINT AT 1,
7; INK 7;"Dangerous gardens";AT
5,10; INK 6;"Q  Up";AT 7,a; INK
5;"A  Down";AT 9,a; INK 4;"O  Le
ft";AT 11,a; INK 3;"P  Right";AT
 13,a; INK 2;"Sym.Shft  Fire";AT
 15,a; INK 1;"O  Abort"
  60 PRINT AT 21,5; INK 7;"Press
 any key to start"
  70 FOR a=1 TO 1000: IF INKEY$<
>"" THEN GO TO 1000
  80 NEXT a: RANDOMIZE USR 28100
: GO TO 2000
1000 RANDOMIZE USR 28147
1010 LET sc=FN x(PEEK 23302)-100
*FN x(PEEK 23301)+10000*FN x(PEE
K 23300)
1020 FOR a=1 TO 5: IF sc<a(a) TH
EN NEXT a: GO TO 2000
1030 IF a<>5 THEN FOR b=5 TO a+1
 STEP -1: LET a$(b)=a$(b-1): LET
 a(b)=a(b-1): NEXT b
1040 INPUT "Name Please "; LINE
a$(a)
1050 LET a(a)=sc
2000 CLS : PRINT AT 0,10; INK 5;
"Hi Scores": FOR a=1 TO 5: PRINT
 AT 5+2*a,5; INK 6;a$(a);" ";a(a
): NEXT a
2010 PAUSE 200: GO TO 50
```

# DANGEROUS GARDENS

## Jason Charlesworth in a fight to the death.




DANGEROUS GARDENS is a game for the 16 or 48K ZX Spectrum which squeezes every ounce from the Spectrum's various features.

Listen to the music at the start of the game. Credit is due to Robert Rhodes who translated the music to Spectrum beeps.

The object of Dangerous Gardens is to rid the five gardens of the creepy crawlies which inhabit them. The problem is that the whole of the garden is radioactive — that's why the plants and animals have mutated and grown so big — and so touching anything results in the loss of a life. However, you are protected by your trusty spray-can.

This spray-can fires in the last horizontal direction it moved. Shooting a sparrow is worth 10 points, a snake 20 points, a spider 30 points, a butterfly 40 points, a wasp 50 points and shooting a widget — the bouncing creature — is worth 99 points. Each of these animals — with the exception of the widget — is featured in one of the five screens.

To set up the game, type in the short Basic listing and save it with:

SAVE "Dangerous" LINE 1

Next type

RANDOMIZE USR 0

to clear out the computer, then type in listing

*(continued on page 81)*

*Listing 1.*

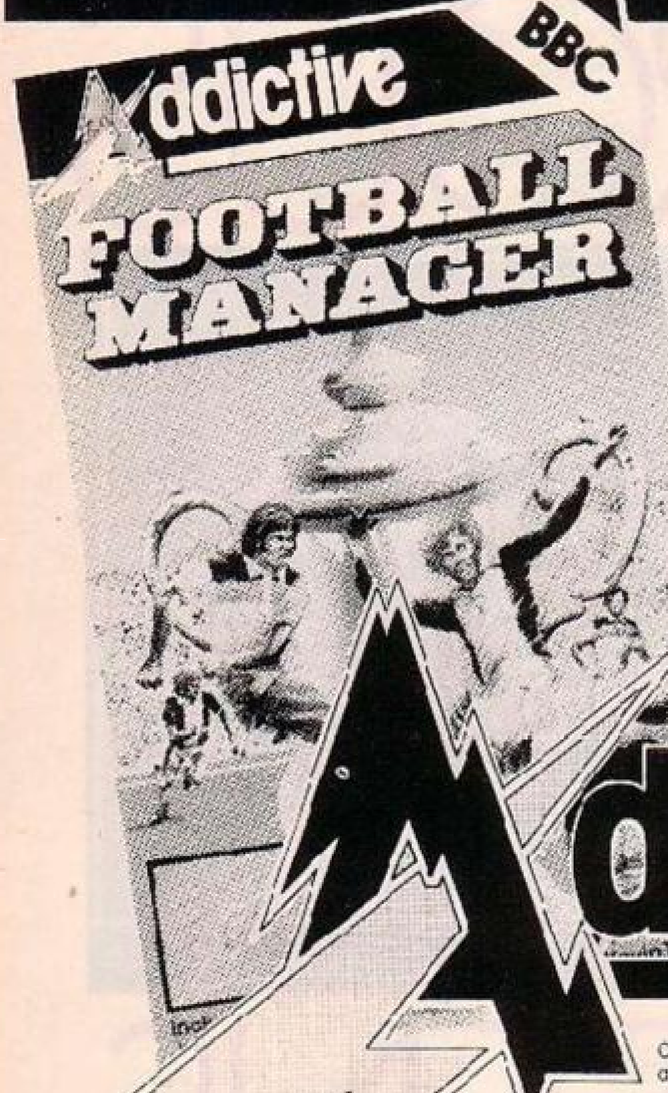
```
  20 DEF FN x(a$)=(CODE a$-48-(3
9 AND a$(1)>"9"))*16+CODE a$(2)-
48-(39 AND a$(2)>"9")
  30 CLEAR 30300: LET x=30335
  40 FOR a=100 TO 470 STEP 10: R
EAD a$: IF LEN a$<>132 THEN GO T
O 70
  50 LET t=VAL a$( TO 4): LET a$
=a$(5 TO ): FOR b=0 TO 63: LET z
=FN x(a$(b*2+1 TO b*2+2)): POKE
x,z: LET t=t-z: LET x=x+1: NEXT
b: IF t THEN GO TO 70
  60 PRINT AT 0,0;"Line ";a;" OK
": NEXT a: PRINT "No errors foun
d": STOP
  70 PRINT "Error in line ";a: S
TOP
 100 DATA "8107cd2670cd416f06647
610fd0605c5cd906f06647610fdcda57
3cd6d700664c5cd5072cd6473c110f6c
d4470c110dfc9cd416fcdc875cd2670c
d906f06647610fd"
 110 DATA "8942cda573cd6d70cd7e6
efeffc8cd9970ed4b015bcd2d77cdd87
6ed4b015bcd2d77cd9976cd5072ed4b0
15bcd2d77cdd876ed4b015bcd2d77cd9
976cd6473cd9970"
 120 DATA "76373a005bfe002020cd0
a70fe0028b8cdec6fcd4470cd906f066
47610fdcda573cd6d70cdec6f189f210
75b35cdc96f3a035b3dfe00c832035b1
8d401feefed78e6"
 130 DATA "714001fe01c83effc9e5f
521b26e47fe0028087e23feff20fa10f
3112f7fed537b5c7efeff2806cd83752
318eef1e1c90e0d04ff13160eff13071
10404ff050e1411"
 140 DATA "2937ff05081504ff110e1
40d03ff0504001314110 80d06ff13070
4ff120f0011110e1612ff120d000a041
2ff120f08030411 12ff0114131304110
50b080412ff1600"
 150 DATA "3495120f12ff0f1104121
2ff12ff130eff1213001113ff03000d0
604110e1412ff06001103040d12ff011
3ff0900120e0dff020700110b0412160
e111307ffcd6b0d"
 160 DATA "602721885c3e07328f5c0
10801ed43885c3e11cd8b6e343e12cd8
b6e010603ed43885c3e13cd8b6e343cc
d8b6e343ccd8b6e010810ed43885c3e0
dcd8b6e3c34cd8b"
 170 DATA "61536e3c34cd8b6e3c34c
d8b6ec9cd6b0d3e07328f5c21885c010
a05ed43885c3e05cd8b6e343a075bcd8
b6e010507ed43885c3e06cd8b6e3c34c
d8b6e343a075bc6"
 180 DATA "671508cd8b6ec9ed4b015
bcd2d77ed4b015b06003e14cd1f763e1
476cd1f7604cd1f763a025bb820f0c90
602c521e80311190006 18e5d5c5cdb50
3c1d1e1a7ed521b"
 190 DATA "542510f1c110e5c93a205
bfef82013210f5b06057efef82009232
3232310f53e01c997c921005b0633360
02310fb21015b368c233654233603cd3
f733e0132325bc9"
 200 DATA "456121205b06143600231
0fb21005b360023368c23365421075b7
e3cfe0520019777cd3f733e0132325bc
921085b4e23463e13cd1f76ed4b015bc
d2d773e05210c5b"
```

*(listing 1 continued on page 81)*

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- ★ 7 skill levels
- ★ Save game facility

# Addictive

* ZX81 Chart Home Computing Weekly 21.2.84

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Comments about the game from press and our customers

"FOOTBALL MANAGER is the best game I have yet seen on the Spectrum and my personal favourite of all the games on any micro ... To the ordinary person it is an excellent view of what can be done in the field of computer games ... The crowning glory of this game is the short set pieces of match highlights which show little stick men running around a pitch, shooting, defending and scoring ... It is a compulsive game but people who cannot take game sessions of 9 hours or so, which happened on one happy Sunday, will be grateful to know that there is a 'save to tape' option. FOOTBALL MANAGER has everything it could ... The originator, Addictive Games, certainly deserve the name." Rating: 19/20 (Practical Computing – August 1983).

"When I first received this game I spent the best part of the weekend playing it. Since then I have returned to it more often than any other. The truly addictive quality of this game is the remarkable way it mirrors the real football managers problems ... "(Personal Computer Games – Summer 1983)

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*(listing 1 continued from page 79)*

```
210 DATA "5718e5f54e2346cd7572c
d1f76f1e1232323233d20ecc901fe7fe
d78e602fe0220093a325bfe002807185
832325b18533e0132325b21245b06057
efe002807232323"
220 DATA "651610f6183d3a215ba71
73d77e5d5c5cd0172c1d1e13a025b3c2
b772b3a015bd608473a215b87878787
0774e2346cd02793effae777c0f0f0fe
603f658673e07ae"
230 DATA "71567721225b0605e5c5c
d1771c1e123232310f4c9e54e2346237
e5fe1fe00c8e5cd02793effae777c0f0
f0fe603f658673e07ae777bfe01200e7
9c6084ffef8380e"
240 DATA "6748e123233600c979d60
64ffe0838f2e1e5712370cd02797efe0
0201136ff7c0f0f0fe603f658673e07a
e77e1c93a205bfe00201621085bcdcc7
1fe01200c3eff32"
250 DATA "6212205b3e99cd3174182
2210c5b3e05e5f52323237efe04300a2
b2b2bcdcc71fe012012f1e1232323233
d20e3e123233600cde971c9f1e123232
336ff3a075b3c87"
260 DATA "6140878787cd317418e35
e23567B923813fe10300f7bd60791300
97bc61B9138033e01c93e00c921e8031
103000606c5d5e5cdb503e111190019d
1c110f1c9215a00"
270 DATA "8521104000614c5d5e5c
db503e1d1c1a7ed5210f2c9fef8c8fcf
f2008cd7572cd1f761809d6f9a71fc61
0cd1f7623237e3d77fef8c8d6f9a71fc
610cd1f76c9211e"
280 DATA "65845bfeff20cf3e13cd1
f7618e0210c5b3e05e5f5cd6472f1e12
32323233d20f2c94e234623237e2b2bf
e0430a8cd7572182ae5237ee603573a0
75b8787825f1600"
290 DATA "3671218b72197ee1c9000
1020304050607080908090e0f0e0f0a0
b0c0dcd1f76237eee0177237efe00200
20505fe0120020404fe0220020c0cfe0
320020d0d78fe08"
300 DATA "5426300406091819fe963
804069618117 9fe0830040e081808fee
6380a0ee618002b7ee60777232b7ee50
35f7ee6fca71f1f3d28101717b3772b7
02b7123cd7572cd"
310 DATA "51361f76c93a785ce61cc
620B3777b23cb4f280e3a015bb938043
6021810360318 0c3a025bbE380436011
80236007ee601ee01a7175f2b7ee6fcb
318bb214b731108"
320 DATA "58575b011900edb0c9789
0fe0808340308963400e6963400780
83401c808340100ed4b085b3a205bfe0
0c242723e13cd1f762a0a5b7c80fe0a3
804fe9538057ced"
330 DATA "7108446778477d81fe0a3
804fee638057ded446f794fed43085b2
20a5b3e13cd1f76c93a075bcdce74cd7
f74cdef73cd3174011516ed43885c3a0
75b3ccd8375cdc6"
340 DATA "660273c997328f5ced4b0
15b3a035be603fe00c8c55f01c0b0ed4
3015bcd2d7779c6104f1d20f2c1ed430
15bc9012f7fed437b5c010116ed43885
c3e0f328f5c211d"
350 DATA "7709747efe00c0feff200
a3a885c3c32865c2318eecd83752318e
812020e1104ffff4ffff4ffffffff110
e140d0300e5d5c5f5010714ed43685c1
1df7eed537b5c21"
360 DATA "6157045b1e0323236277
7300e2b7ec601277730062b7ec601277
721045b3e0f328f5c7ef5e6f01f1f1f1
fcd8375f1e60fcd8375231d20ebf1c1d
1e1c91e030e00cd"
370 DATA "7185b6741ec00effcdb67
40606cd987406a8cd9874c90e08cd027
936ff2436f47c0f0f0fe603f65867364
f79c608fef74f38e5c90606cd0279737
c0f0f0fe603f658"
380 DATA "70506736440478feaa20e
bc9f597328d5ccd6b0df187212e755f1
600195e2356eb7efeffc84fe6f81f1f1
f4779e607235e2356ed53885cfe03281
2fe04280efe0520"
390 DATA "6294023e03e5cd3875e12
318d4.10f7eed537b5cd6031e05f5fe0
028021e077b328f5cf1cd837510fb231
8b50f7a7c7ae07a207b547b217375a71
717853001246f5e"
400 DATA "64902356ed537b5c237e3
28f5c2397cd83753e02cd8375ed4b885
c0d0d04ed43885c7e328f5c3e01cd837
53e03cd8375c9df7c0402ff7c04031f7
d02471f7e4141e5"
410 DATA "6480d5c5f5ed4b885c0ce
d43885c0da7cb10cb10cb10cb11cb11c
b11171717ed5b7b5c833001145fcd027
906081a77132410fa257c0f0f0fe603f
658673a8f5c77f1"
420 DATA "7068c1d1e1c9066421447
9c57ee5feff28324f0600cd2b2dc1c80
0cd2b2def0538e123e54e0600cd2b2d0
:6400cd2b2def0338cdf803e123cd127
6feff200fc110c9"
430 DATA "893018c22346e123e5761
0fd18e8c1c901fefded78e602fe02c83
eff c9e5d5c5f5dde5214576l6005f191
919197e328f5c23235e2356d5dde1cdf
677dde1f1c1d1e1"
440 DATA "5268c90700df7b0700ff7
b0700bf7b07009f7b45001f7c45003f7
c45005f7c45007f7c44009f7c4400bf7
c46003f7d46005f7d46007f7d46009f7
d4300bf7d4300df"
450 DATA "53007d07003f7e07005f7
e07007f7e06009f7e0700bf7eed4b015
b050d78c61257601e0acdeb78202942c
deb782023440c1d20f0ed4b015b0d057
9c60a57611e17cd"
460 DATA "5922eb784c200b4acdeb7
82005041d20f0c932005bc91100003a2
15b6f01fedfed78cb4720041e022e01c
b4f20041efe2e0001fefb7d32215bed7
8cb47200216fe01"
470 DATA "7540fefded78cb4720021
602ed4b015b7a80fe093805fe9730014
77b81fe093805feef30014fed43015bc
9f5c5d5e53e47328f5cdd21f47dcd027
9e5286c3271777c"
```

*(continued from page 79)*

I and run it. Save it to tape directly after Dangerous:

SAVE "CODE1" CODE 30335,2432

This then needs to be repeated for listing 2 except the code needs to be saved after Code 1:

SAVE "CODE2" CODE 30000,2240

These two blocks of code must now be combined into 1 block of code so type

RANDOMIZE USR 0

Rewind to the start of Code 1 and:

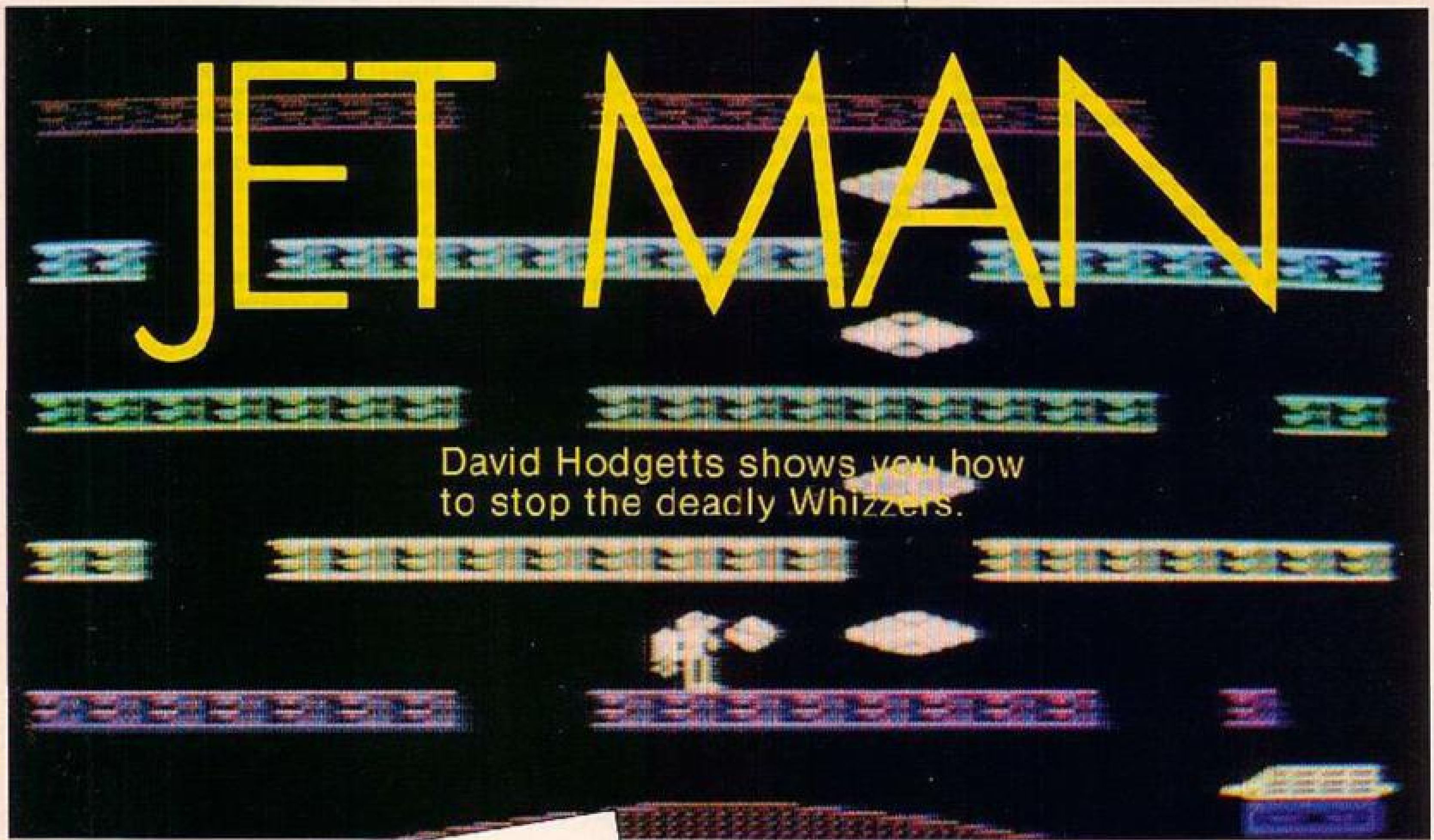
CLEAR 28099:LOAD "CODE1" CODE 28100:LOAD "CODE2" CODE 30532

SAVE "CODE" CODE 28100,4667

To run type Load " ".

*Listing 2.*

```
20 DEF FN x(a$)=16*(CODE a$-48
-(39 AND a$(1)>"9"))+CODE a$(2)-
48-(39 AND a$(2)>"9")
40 CLEAR 29999: LET x=30000: F
OR a=100 TO 370 STEP 10: READ a$
: LET t=VAL a$( TO 4): LET a$=a$
(5 TO ): IF LEN a$<>160 THEN GO
TO 70
50 FOR b=0 TO 79: LET z=FN x(a
$(b*2+1 TO b*2+2)): POKE x,z: LE
T x=x+1: LET t=t-z: NEXT b: IF t
THEN GO TO 70
60 PRINT AT 0,0;"Line ";a;" OK
": NEXT a: PRINT "No errors foun
d": STOP
70 PRINT "Error in line ";a: S
TOP
100 DATA "73460f0f0fe603f658673
a8f5c5fae77237bae7778e607280c7b1
120001 95fae772b7bae775059e13e100
8dd4e000602afcb191f10fb23ae772b7
ea977083d2811 0814dd23247ce60720e
0424bcd027918d9"
110 DATA "79787c0f0f0fe603f6586
73a8f5c5fae77237bae77e1d1c1f1c97
c0f0f0fe603f658673a8f5c5fae7778e
60728077b1120001 9ae77e159503e100
8dd7e0Cae77083d2811 08dd23247c14e
60720ed424bcd02"
120 DATA "82087918e67c0f0f0fe60
3f658673a8f5c3f18aecd0279e5ca857
8ed435e78323b787c0f0f0fe603f6586
73a8f5c5fae77237bae77237bae7778e
60728107b1120001 95fae772b7bae772
b7bae77e13e1008"
130 DATA "7733dd5eC0dd56100602a
fcb1bcb1a1f10f92323ae772b7eaa772
b7eab77083d281908dd23247ce60720d
701e2640 85f0 83e1093F047cd0279:8c
77c0f0f0fe603f658673a8f5c5fae772
37bae77237bae77"
140 DATA "7417c97ced43d0780f0f0
fe603f658673a8f5c5fae77237bae777
8e60720 0c7b1120001 95fae772b7bae7
7e13e1008dd5e00dd5610237eaa772b7
eab77083d281908dd23247ce60720e30
85f080128103e10"
150 DATA "8257938047cd027918d57
c0f0f0fea03f658673a8f5c5f1892e5c
5cd0279fe0028084 77ea71710fc18017
ee680c1e1c978a71f371fa71fa8e6f8a
8677907070 7a8e6c7a8070 76f79e607c
900000000000000"
160 DATA "3718000000000000000000
00000000000000000000000000C0000
00000000000000 465b23a0236c23732
36c2370467323 6b237323ab236e69734
65b2350236c2373236c23704673236b2
373235b236e6973"
170 DATA "6003235b23a7235c236c2
36f2374235b2373235b2373235c236c2
36f237423 5b2373ff11234823 5423572
3602354236023 63236c236023 6c236f2
378236c2378237b23844684468446842
3844684237f2381"
180 DATA "6126237c237f4681467 82
37a237b2378237a467c2378237c23784
67a4678f09467E467846782378467 82
373237523 7023734675466c236e236f2
36c236e4670236c2370236c466e466c0
00000a0b010a13"
190 DATA ":173010a0b130a13132b0
4C42b17042b04112b17110b04050b040
6Cb04070b040 80b040d0b040e0b040f0
bC4100b1b050b1b060b1b070b1b080b1
bCd0b1b0e0b1b0f0b1b101c0b081c0b0
d1c12081c120d0c"
200 DATA ":3360b090c0b0a0c0b0b0
cCb0c0c14090c140a0c140b0c140cff0
81d010815040 80e06081b100a04040a0
f0c0a080e0d09070d150e0d031009130
80908130917132c01082c010c2c1a082
c1a0c0b0d010b0c"
210 DATA "1559020b0d030b0d040b0
d110b0d120b0d130b0d140b120 10b120
20b12030s12040b12110b12120b:2130
b1214ff4504044b1304430c0913060c1
3180c4401084417081c01111c1c:10a0
f040a0c040a120c"
220 DATA "19870a09120a151208080
d08160d080f100d040c0d1a0c090e0d0
9100dff6304044310045b01115a14:12
30e1164040d64100d140f08140f090a0
1080a1d08080408081aC809070309:70
80d0a0E0d1408ff"
230 DATA "12803b04C4130509230e1
11c0e041c0e090b0705Cb07060a07070
b07080b04080c0d050cCd060c0d070c0
d080c11050c1108081aC40a0f0d0a010
e0a050f0a07100a15100a190f0a1d0ef
f00000C00000080"
240 DATA "411540303b3e111b0c070
20408000000000814df7cf8b870e04
080c00000C000008040733e111f0f070
202030000C000040a1fde3cd8f8f0e04
0201800000C000001028fb3e1f1d0e070
20103000000001"
250 DATA "7125020cdc7c88d830e04
0201000000C0002050f87b3c1b1f0f070
20418000000000102ce7c88f8f0e04
040c0807c725e5c3c0c1c3c78f2effff
ff8700000000000000000207c78e1ef
cfc783c72fff70e"
260 DATA "64653e060e1c397377f7
e7c380000000000000000040e8ec7e7ef7
e7e3c000000000000000040e0e0717b3
f3f1e0:3e4e7a3a3:30383c1e4ff7fff
f1f0e000000000000002070e1e3e7f77
e7e3c3c4effef70"
270 DATA "60377c6070389cceeefe7
e3e1c00000000004022257494f5793a4a
4a8a8000000000204042ea92f2eac5252
5151500000000000008040217294f579
394a4000000000000102040e894f2eac
9292500003c1e1f"
280 DATA "72440f00000e1f1f1f1f1
f0f372020204C40408080b8fcfcfcfcf
cf870000f3e3c03040808101078fcfcf
cfc7840c0404Ca010080804041e3f3f3
f3f1e031f77ffddffff7303030703030
30307c0f87ef7ff"
290 DATA "7379fbffcec0c0e0c0c0c
0c0e00304090a05030e5ffffffee49141
2093038c4041Ee00078a4ca92e23d000
000300001020201030edffff4e09141
222000 0be4186788078a4ca92e61d000
0000003344c2219"
300 DATA "7763041e255369a61c010
202008040404020a0e2f7fffe2a0201
080000e1:304c621d1e255369a69c000
0000000B040402020e2f7fffe2a0905
04300043249a59593ab47734b87b5b48
44930204c92a8a9"
310 DATA "9462c9d5e2ced2e1ad2d2
1120c02122955554b532323334f45747
44330104894aaaad2d2c4c4ccf2a22e2
e120c3c3c107ebdc3f'fdfdfcfdfdfdf
dff7e227722ff2222ff2200001824428
181ff00000100e0"
320 DATA "7416f0783c1c020100000
000001038c7d6447c7210101020e0204
040403e7bddfff77f0705070c0f05060
707057cf6fbdff3fe60e0e0d07060e0a
0e020064add96e44e030503050a05020
504056836abd7b3"
330 DATA "454452402020505000e08
02020060854942440010101040001020
104006850ab5892424000204010002 08
02020386462020f19393f3b1c0f04081
010701c264640f0989cfcdc38f020100
8030e0102071c24"
340 DATA "71897c40407c040404040
40407e060a0bec6fa0c0cf8a0a0a0a0a
0c0803c7e666666667e3c:8381818181
83c3c7c7e063e7c607e7e7e74030f0f0
37f7e0e1e36667f7f06067f7f607e7f0
37f7e3f7f607e7f"
350 DATA "7758637f3e7f7f06060c0
c18183e7f637f7f637f3e3e7f637f3f0
37f7e3e7f637f7f6363637e7f637e7e6
37f7e3f7f606060607f3f7e7f6363636
37f7e3f7f607878607f3f3f7f6078786
063603f7f606063"
360 DATA "78017f3f036363637f7f6
363637f7f181818187f7f7f7f0606666
67e3c53666c787e6c656360606060606
07f3f777f6b63636363636363737b6f6
763633e7f6363636363 7f3e7e7f63637f7
e60603e7f63637b"
370 DATA "640C7f3e037e7f637f7e6
c66633f7f607e3f037f7e7f7f0c0c0c0
c0c0c6363636363637f3e636363636363
61c08636363636b7f776363633361c1c3
663636363637f3f037f7e7f7f0e1c387
07f7f000000000c"
```



# JET MAN

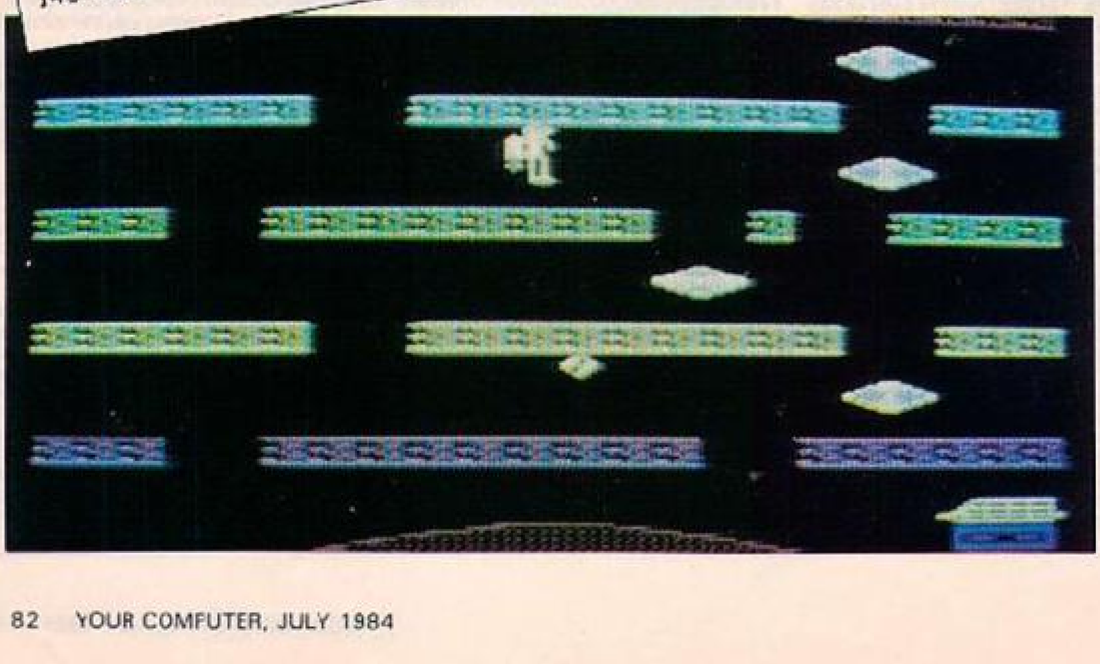
David Hodgetts shows you how to stop the deadly Whizzers.

*Listing 1.*

```
1 DATA 160,0,177,0,201,32,208,36,165,38,145,0
2 DATA 160,22,177,0,201,32,208,24,230,38,165,38
3 DATA 145,0,198,38,166,0,164,1,142,61,3,140
4 DATA 62,3,169,0,141,60,3,96,141,60,3,166
5 DATA 3,164,1,142,61,3,140,52,3,96,234,234
6 DATA 234,32,240,25,206,240,2,240,1,96,169,11
7 DATA 141,240,2,32,224,26,96,0,169,147,32,210
8 DATA 255,169,8,141,15,144,169,255,141,5,144,162
9 DATA 0,169,14,157,66,30,157,154,30,157,242,30
10 DATA 157,74,31,157,162,31,232,224,22,208,234,162
11 DATA 0,138,157,234,31,160,2,152,157,234,151,232
12 DATA 224,13,208,241,162,0,169,2,157,66,150,169
13 DATA 3,157,154,150,169,5,157,242,150,169,7,157
14 DATA 74,151,169,4,157,162,151,232,224,22,208,226
15 DATA 169,10,141,131,30,141,219,30,141,51,31,141
16 DATA 139,31,162,23,142,225,31,232,142,226,31,232
17 DATA 142,227,31,232,142,247,31,232,142,248,31,232
18 DATA 142,249,31,162,7,142,225,151,142,225,151,142
19 DATA 227,151,162,6,142,247,151,142,248,151,142,249
20 DATA 151,162,21,142,43,30,162,3,142,43,150,96
21 DATA 162,66,150,30,134,0,132,1,32,80,26,162
22 DATA 242,160,30,134,0
90 PRINT"****JET MAN PART 1****"
95 PRINT"PLEASE WAIT....."
100 FORA=6400TO6656:READN:T=T+N:IFN=0THENS=S+1
110 POKEA,N:NEXT
120 IFT<>30660THENPRINT"DATA ERROR":END
130 IFS<14THENPRINT"ZERO MISSING ERROR":END
135 IFS>14THENPRINT"TOO MANY ZEROS ERROR":END
140 PRINT"NOW LOAD THE NEXT PART"
```

*Listing 2.*

```
1 DATA 0,132,1,32,80,26,162,162,160,31,134,0
2 DATA 132,1,32,80,26,162,149,160,30,134,0,132
3 DATA 1,32,111,26,162,69,160,31,134,0,132,1
4 DATA 32,111,26,32,0,27,32,192,27,96,174,61
5 DATA 3,134,0,174,62,3,134,1,169,32,160,0
6 DATA 145,0,160,22,145,0,173,64,3,133,0,173
7 DATA 65,3,133,1,76,0,25,0,160,0,177,0
8 DATA 200,201,32,203,249,192,23,16,17,136,169,14
9 DATA 145,0,169,32,200,145,0,200,145,0,200,76
10 DATA 82,26,96,160,26,177,0,136,201,32,208,249
11 DATA 192,4,48,17,200,169,14,145,0,169,32,136
12 DATA 145,0,136,145,0,136,76,113,26,96,0,0
13 DATA 120,169,160,141,20,3,169,26,141,21,3,88
14 DATA 96,0,0,0,169,0,141,19,145,141,34,145
15 DATA 173,17,145,41,31,74,74,133,144,173,17,145
16 DATA 41,32,74,5,144,133,144,173,32,145,41,128
17 DATA 74,74,74,74,5,144,73,31,133,144,169,255
18 DATA 141,34,145,152,6,254,112,28,202,208,250,32
19 DATA 128,27,76,191,234,0,0,0,169,32,141,66
20 DATA 30,141,175,30,141,242,30,141,95,31,141,162
21 DATA 31,96,0,0,0,0,0,0,0,0,0,0
22 DATA 0,0,0,0,162
90 PRINT"****JET MAN PART 2****"
95 PRINT"PLEASE WAIT....."
100 FORA=6656TO6912:READN:T=T+N:IFN=0THENS=S+1
110 POKEA,N:NEXT
120 IFT<>22064THENPRINT"DATA ERROR":END
130 IFS<44THENPRINT"ZERO MISSING ERROR":END
135 IFS>44THENPRINT"TOO MANY ZEROS ERROR":END
140 PRINT"NOW LOAD THE NEXT PART"
```



JET MAN IS A game for unexpanded Vic-20 and a joystick. The game comes in five parts, the first three set up the machine code, the fourth is for the graphics and the fifth is the Basic part of the program. The game itself is mainly machine code, and has 10 different speed levels. At the start of the game you are faced with five bars running across the screen, in these bars are spaces which move, and you have to guide Jet Man through them, but be careful, as you only have one Jet Man.

When you reach the top of the screen you then have to touch the switch at the top left, this then switches off the generator which supplies the energy to the Whizzers which move along between the force fields, and these will kill Jet Man if he is moving and they hit

Listing 3.

```
1 DATA 162,110,160,30,134,4,132,5,32,45,27,162
2 DATA 198,160,30,134,4,132,5,32,45,27,162,30
3 DATA 160,31,134,4,132,5,32,45,27,162,118,160
4 DATA 31,134,4,132,5,32,45,27,96,165,4,133
5 DATA 6,165,5,133,7,190,4,160,22,177,4,201
6 DATA 10,240,8,201,12,240,4,136,208,243,96,159
7 DATA 32,145,4,145,6,136,240,19,177,4,201,15
8 DATA 240,13,201,16,240,9,169,10,145,4,169,11
9 DATA 145,6,96,169,32,145,4,160,22,169,10,145
10 DATA 4,96,0,0,32,80,25,32,144,26,96,0
11 DATA 0,0,0,0,0,0,0,0,0,162,0,160,30
12 DATA 134,2,132,3,32,145,27,230,3,32,145,27
13 DATA 95,160,255,177,2,201,11,240,8,201,13,240
14 DATA 17,136,208,243,96,169,13,145,2,136,169,12
15 DATA 145,2,200,76,157,27,169,11,145,2,136,169
16 DATA 10,145,2,200,76,157,27,0,0,0,0,0
17 DATA 152,6,254,112,28,202,208,250,162,0,160,30
18 DATA 134,0,132,1,32,219,27,230,1,32,219,27
19 DATA 95,234,234,160,255,177,0,201,15,240,8,201
20 DATA 15,240,11,136,208,243,96,169,16,145,0,76
21 DATA 231,27,169,15,145,0,76,231,27,96,95,0
22 DATA 95,0,0,0,0
90 PRINT"J****JET MAN PART 3****"
```

him, but they will not kill him if he is standing still.

Sometimes Jet Man can survive a collision with a force field, but not too often. Jet Man has one defence against the Whizzers, these are small rotating bombs which he can lay in the path of the Whizzers and if a Whizzer hits one it is destroyed, but another Whizzer appears at the left hand side of the screen. Jet Man has an infinite supply of these bombs.

At the bottom of the screen is part of a plane from where Jet Man starts from, and at the bottom left is the generator which supplies the Whizzers with their energy.

In the machine code is an interupt to control the spinning of the Whizzers and one to read the joystick.

Each of the first four programs which set up the machine code and graphics has two check sums. The first check sum is to check that all of the data is correct, and the second is to check that the number of zeros is correct. If the data is wrong then you will get a data error, or if the number of zeros is incorrect then you will get a "too many zeros error", or a "zero missing error", in this case you will have to re-check the data.

After each loader has been run you will then be asked to load the next part.

Listing 4.

```
1 DATA 0,0,0,0,0,3,30,253,0,0,0,3
2 DATA 62,245,170,85,0,0,31,245,170,85,170,85
3 DATA 3,127,234,85,170,85,170,85,255,95,170,85
4 DATA 170,85,170,85,255,85,170,85,170,85,170,85
5 DATA 192,126,171,85,170,85,170,85,0,0,248,95
6 DATA 170,85,170,85,0,0,0,192,252,87,170,85
7 DATA 0,0,0,0,0,128,248,95,3,15,51,193
8 DATA 193,51,15,3,192,240,204,131,131,204,240,192
9 DATA 3,12,62,255,255,62,12,3,192,48,124,255
10 DATA 255,124,48,192,255,47,230,193,47,230,193,255
11 DATA 0,24,60,78,114,60,24,0,0,24,52,118
12 DATA 110,44,24,0,12,27,30,76,254,237,237,235
13 DATA 252,170,74,170,74,10,10,15,48,216,120,50
14 DATA 127,183,183,53,63,95,82,85,82,80,80,240
15 DATA 0,19,51,11,7,3,3,3,0,3,3,3
16 DATA 7,11,51,19,0,3,6,15,28,255,244,31
17 DATA 0,255,68,255,68,255,68,255,0,252,68,252
18 DATA 69,255,71,252,20,31,31,24,27,24,31,31
19 DATA 68,255,255,0,227,0,255,255,68,252,252,12
20 DATA 236,12,252,252
90 PRINT"J****JET MAN PART 4****"
95 PRINT"QQPLEASE WAIT....."
97 FORA=7399TO7679:POKEA,0:NEXT
100 FORA=7168TO7399:READN:T=T+N:IFN=0THENS=S+1
110 POKEA,N:NEXT
120 IFT<>23893THENPRINT"DATA ERROR":END
130 IFS<31THENPRINT"ZERO MISSING ERROR":END
140 IFS>31THENPRINT"TOO MANY ZEROS ERROR":END
150 PRINT"QQNOW LOAD THE NEXT PART"
```

Main game.

```
0 POKE650,128:Q=72:POKE36879,10:PRINT"J*******  JET MAN  *******"
1 PRINT"QQBY DAVID HODGETTS"
2 PRINT"QQJOYSTICK ONLY"
3 PRINT"QQ PRESS FIRE TO START":SYS6800
4 PRINT"QQQQQQQQQQQQQQQQSELECT LEVEL:";SE
5 IF(ST AND8)THENSE=SE+1:Q=Q+20:IFSE>9THENSE=0:Q=72
6 IF(ST AND4)THENSE=SE-1:Q=Q-20:IFSE<0THENSE=9:Q=252
7 FORS=0TO50:NEXT:IF(ST AND16)<>16THEN4
9 CH=17:POKE36878,15:POKE828,0:POKE752,1
10 POKE832,0:POKE833,30:POKE829,0:POKE830,30:POKE37159,Q
11 SYS7024:FORA=0TO50:NEXT
13 SYS6458:IFPEEK(828)<>0THEN500
14 IF(ST AND1)THENX=X-22
15 IF(ST AND2)THENX=X+22:D=1
16 IF(ST AND4)THENX=X-1:CH=19
17 IF(ST AND8)THENX=X+1:CH=17
19 HL=8130+X:H=INT(HL/256):L=HL-256*H:POKE832,L:POKE833,H:POKE38,CH:SYS6702
20 IF(ST AND16)THENGOSUB101
30 POKE36877,SO:SO=SO-3:IFSO<220THENSO=242
60 GOTO13
101 POKE8130+X+1,16:RETURN
500 IFPEEK(828)<>21THEN510
501 PRINT"QQQQQQQQQQQQSECTION";SE;"CLEARED":SE=SE+1
502 FORA=200TO240STEP5:FORS=10TO0STEP-1:POKE36875,A-2*S:POKE36875,A-20-2*S:NEXT
503 NEXT:POKE36875,0:POKE829,0:POKE830,30:POKE828,0:SYS7024:X=0
504 Q=PEEK(37159):Q=Q+20:IFQ>255THENQ=255
505 POKE37159,Q:GOTO13
510 CLR:PRINT"QQQQQQQQQQQQQQQQQQGAME OVER":POKE36877,0:POKE36869,240
520 FORA=0TO500:NEXT:RUN
```

```
1 PRINT"■"POKE52,48:POKE56,48:POKE788,52:RUN1000
10 SC=0:LV=0:NW=3:ES=1000
90 MX=5:IX=20+5*INT(LV/16):NM=5
100 GOSUB900:GOSUB200:POKESD+14,0:POKESD+15,3
110 J=J(BFANDNOTPEEK(JP)):IFJ=>.THENIF(J+D)AND1THEND=J
120 O=F+D(J):J=PEEK(O):IFJ<>SPTHEN300
130 POKEV3,W3+1:POKEQ+SD,C:POKEQ,H:POKEP,I+D:P=Q
140 L=L+1:IFL>MXTHENQ=T+D(PEEK(T)AND3):POKET,SP:T=Q:L=MX:GOTO160
150 FORX=1TO10:NEXT
160 BO=BO-1:IFBO=.THENBO$=MID$(BO$,2):PRINTBL$BO$:BO=6:PRINT" ■"
170 POKEV3,W3:SYSMC:GOTO110
200 BO=1:IFNM=0THENBO$="":GOTO400
210 BO$="▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌"
220 Y=INT(RND(1)*21+2):X=INT(RND(1)*38+1):MP=SS+X-Y*F0:IFPEEK(MP)<>SPTHEN220
230 POKESD-8,80:POKEV2,W2+1:POKEMP+SI,1:POKEMP,MR:POKEV2,W2
240 PRINTBL$TAB(73)LEFT$("▙▁▏▁▏",NM+1)"■ ■"
250 RETURN
300 IFJ<>MRTHEN500
310 POKEQ,EX:ME=ME+1:BO=ME*LEN(BO$):SC=SC+20+BO:IFSC>HITHENHI=SC
320 MX=MX+IX:IFMX>255THENMX=255
330 POKESD-8,40:POKEV2,W2+1:FORI=40TO60:POKESD+8,I:I=I+1-1:NEXT:POKEV2,0
340 PRINTBL$"▙"ME "■ X"LEN(BO$)"■ ="BO"■          ■"
350 NM=NM-1:GOSUB200:BO=10
360 IFSC=>ESTHENNW=NW-(NW<9):ES=ES+1000
390 GOSUB990:GOTO130
400 POKE1504,EX:POKE1543,EX:POKE1083,EX:POKE1963,EX
410 FORI=1TO2:POKEWC+1,0
420 POKESD+8,40:POKEV2,W2+1:FORDU=1TO50:NEXT:POKEV2,W2:FORDU=1TO50:NEXT
430 POKEWC+1,11
440 POKESD+8,80:POKEV2,W2+1:FORDU=1TO50:NEXT:POKEV2,W2:FORDU=1TO50:NEXT
450 NEXT:PRINTBL$"▌▌▌▌▌▌                              ■"
460 POKEV2,0:RETURN
500 IFJ<>EXTHEN600
510 POKEP,J:POKEQ+SD,C:POKEQ,H:FORX=1TO70:NEXT:POKEQ,J:V=2:POKESD+15,0
520 POKEV3,W3+1:FORX=0TOL-1:Q=T+D(PEEK(T)AND3):POKET,SP:T=Q:POKESD+15,X
530 SYSMC:FORI=1TO70:NEXT:NEXT:POKESD+15,X
540 POKEP,SP:FORI=1TO70:NEXT:POKEV,SP:FORI=1TO70:NEXT:POKEV3,0
550 PRINT"▌▌▌▌▌▌▌▌▌▌▌"TAB(13)" ▁▁▁▁▁▁▁▁▁"
560 PRINTTAB(13)" ■ WELL DONE ■ "
570 PRINTTAB(13)" ▔▔▔▔▔▔▔▔▔"
580 GOSUB800:LV=LV+1:PRINTTAB(12)"▌▌▌NOW TRY LEVEL"LV+1
590 FORX=1TO1200:NEXT:GOTO90
600 POKEP,I
610 FORX=1TO200:NEXT
620 PRINT"▌▌▌▌▌▌▌▌▌▌"TAB(14)" ┌───────┐"
630 PRINTTAB(14)" ▙ OHOOPS ! ■!"SPC(28)" └───────┘"
640 POKESD+7,0:POKESD+8,12:POKEV2,W2+1
650 FORDU=1TO340:NEXT:POKEV2,W2
660 POKESD+8,6:POKEV2,W2+1
670 FORDU=1TO340:NEXT:POKEV2,W2:FORX=1TO200:NEXT
690 NW=NW-1:IFNW=0THENFORX=1TO200:NEXT:GOTO700
695 GOTO100
700 PRINT"J":GOSUB900
710 PRINT"▌▌▌▌▌"TAB(13)"■ ┌───────┐"
720 PRINTTAB(13)" ▌▌▌ !*\" "X"▁ ■■!"SPC(27)" └───────┘"
730 PRINT"▌▌▌▌▌PRESS THE ▁▁▔ BUTTON TO PLAY AGAIN
740 PRINT"▌▌▌▌▌(OR ANY KEY TO END THE GAME)
750 GOSUB850:POKE198,0
760 GETK$:IFK$<>""THENPRINT"J":POKE788,49:POKEV1,0:POKEV2,0:POKEV3,0:END
770 IFPEEK(JP)AND16THEN760
780 GOTO10
800 POKESD+7,195:POKESD+8,16:POKEV2,17
810 FORJ=1TOLEN(M1$)STEP3
820 N0=ASC(MID$(M1$,J)):N1=ASC(MID$(M1$,J+1)):DU=ASC(MID$(M1$,J+2))*10
830 POKESD,N0:POKESD+1,N1:POKEV1,W1+1
840 FORND=1TODU:NEXT:POKEV1,W1:NEXT
845 POKEV2,0:POKEV1,0:RETURN
850 FORJ=1TOLEN(M2$)STEP3
860 N0=ASC(MID$(M2$,J)):N1=ASC(MID$(M2$,J+1)):DU=ASC(MID$(M2$,J+2))*10
870 POKESD,N0:POKESD+1,N1:POKEV1,33
890 FORND=1TODU:NEXT:POKEV1,32:NEXT
895 POKEV1,0:RETURN
900 ME=0:D=0:F=1066:T=F:L=0
910 POKE53265,11:POKE53281,11:PRINTB$:POKE53281,0:POKE53265,27
920 POKEWC,C(LVAND7):POKEWC+1,11:I=1:M$=M$(LVAND15OR-8*(LV>15))
930 X1=ASC(MID$(M$,I)):IFX1=0THEN990
940 X2=ASC(MID$(M$,I+1)):Y1=ASC(MID$(M$,I+2)):Y2=ASC(MID$(M$,I+3))
945 IFX1>39ORX1<1ORX2>39ORX1<1ORY1>22ORY1<1ORY2>22ORY2<1THENSTOP
950 FORX=X1TOX2:FORY=Y1TOY2
960 POKESS-X+F0*Y,BD:NEXT:NEXT
970 I=I+4:GOTO930
980 PRINTBL$
990 PRINT"■■"TAB(13-LEN(STR$(SC)));SC"■"TAB(27-LEN(STR$(HI)))HI"■"TAB(35)NW"■ "
999 RETURN
1000 PRINT"J"CHR$(142)CHR$(8):POKE53280,0:POKE53281,0
1010 CB=12288:CR=53296:PRINTTAB(13)"▌▌▌▌▌▌PLEASE WAIT"
```



# WRIGGLY

**Keith Suddick explains how you too can help Wally the Worm.**

WALLY THE WORM has got himself lost. While he was out looking for food he managed to stumble into a maze, which luckily was full of his favourite food, mushrooms. The trouble is he can't find his way out, so you're going to have to help him.

Slithering around the rooms in this maze is hard work and Wally needs to keep up his strength by eating the five mushrooms in each room. When the room is empty, the doors will appear and Wally can wriggle through them into the next room. The real problem is that every time Wally eats one of the mushrooms he gets a bit longer, his doctor has told him not to bump his head on anything so hitting the walls or even himself won't do Wally any good.

Don't worry though, in the same way that cats have nine lives, worms have three . . . usually.

At the start of each screen after the room has been drawn, Wally the Worm will appear near the bottom left hand corner of the room, a joystick connected to port 2 will control Wally's movement.

In each room there are five mushrooms and these will appear one at a time at random positions in the room. For each mushroom that Wally eats you are awarded 20 points. In addition to this, at the bottom of the screen is a bonus counter which starts at 20 and counts down to 0 as Wally moves around the screen.

When Wally eats a mushroom the value of the bonus counter is multiplied by the number of mushrooms Wally has eaten since the start of the screen or since last bumping into something, whichever was the most recent. This bonus is added onto your score and displayed at the bottom of the screen before the bonus counter is reset for the next mushroom.

It is possible in theory to score 400 points per room but that is very unlikely to ever happen.

The other thing that happens when Wally eats the mushrooms is that he grows longer. As you progress through the game the rate at which he grows will also increase — remember Wally isn't allowed to bump into himself.

After the fifth mushroom has been eaten, the exits from the room will appear and Wally can leave by any of them; at the higher levels some of the exits may be blocked but there is always a way out.

There are 16 levels or rooms in the game but after level 16 the program repeats the patterns for rooms 8 to 16 but increases the difficulty by making Wally grow longer.

## Key sequences

You start the game with three worms and an extra worm is awarded every 1000 points up to a maximum of nine. The number of worms you have left along with your score and the current high score is displayed on the top line of the screen.

Table 1 gives the appropriate key sequences for the control characters in the program.

Some of the graphics characters in the listing may also be a little confusing but it is important to get them correct so table 2 gives details of the important ones used.

The program contains a small machine code routine in the data statements so make sure you save a copy of the program before trying to run it. The machine-code routine is called for each character that Wally moves, it makes a small change to the user-defined characters used for Wally's body to improve the impression of movement as the worm moves through each room.

*Program breakdown.*

| | | |
|---|---|---|
| lines | 1-90 | Initialisation for program, game and room respectively. |
| lines | 100-170 | Main program loop, reads joystick, checks for collisions, decrements the bonus counter and makes the noise of Wally moving. |
| lines | 200-250 | If there are any mushrooms left then this routine generates the position for a new mushroom on the screen and also resets the bonus counter. |
| lines | 300-390 | Calculates the points for eating a mushroom, adjusts the high score if |

*Table 1.*

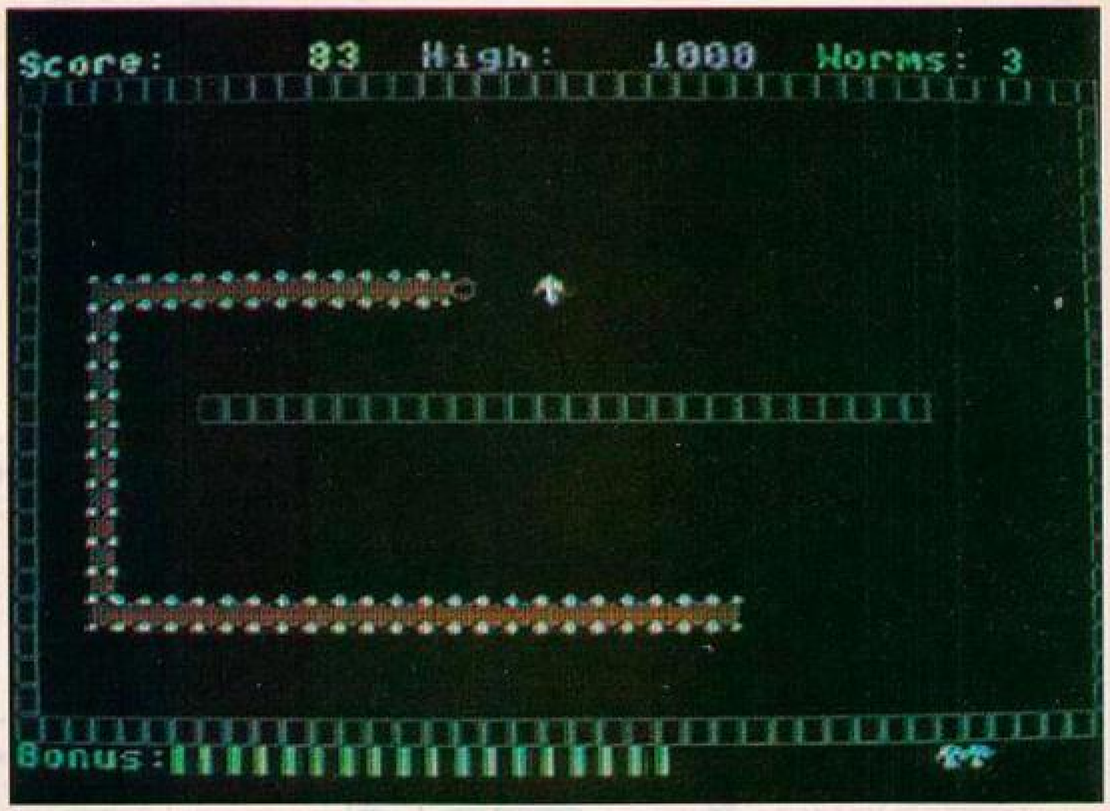
| | | | |
|---|---|---|---|
| ■ | HOME | ■ | CLR |
| ■ | CURSOR DOWN | ■ | CURSOR UP |
| ■ | CURSOR RIGHT | ■ | CURSOR LEFT |
| ■ | REVERSE ON | ■ | REVERSE OFF |
| ■ | CTRL + 1 | ■ | CTRL + 2 |
| ■ | CTRL + 3 | ■ | CTRL + 4 |
| ■ | CTRL + 5 | ■ | CTRL + 6 |
| ■ | CTRL + 7 | ■ | CTRL + 8 |
| ■ | COMMODORE + 1 | ■ | COMMODORE + 2 |
| ■ | COMMODORE + 3 | ■ | COMMODORE + 4 |
| ■ | COMMODORE + 5 | ■ | COMMODORE + 6 |
| ■ | COMMODORE + 7 | ■ | COMMODORE + 8 |

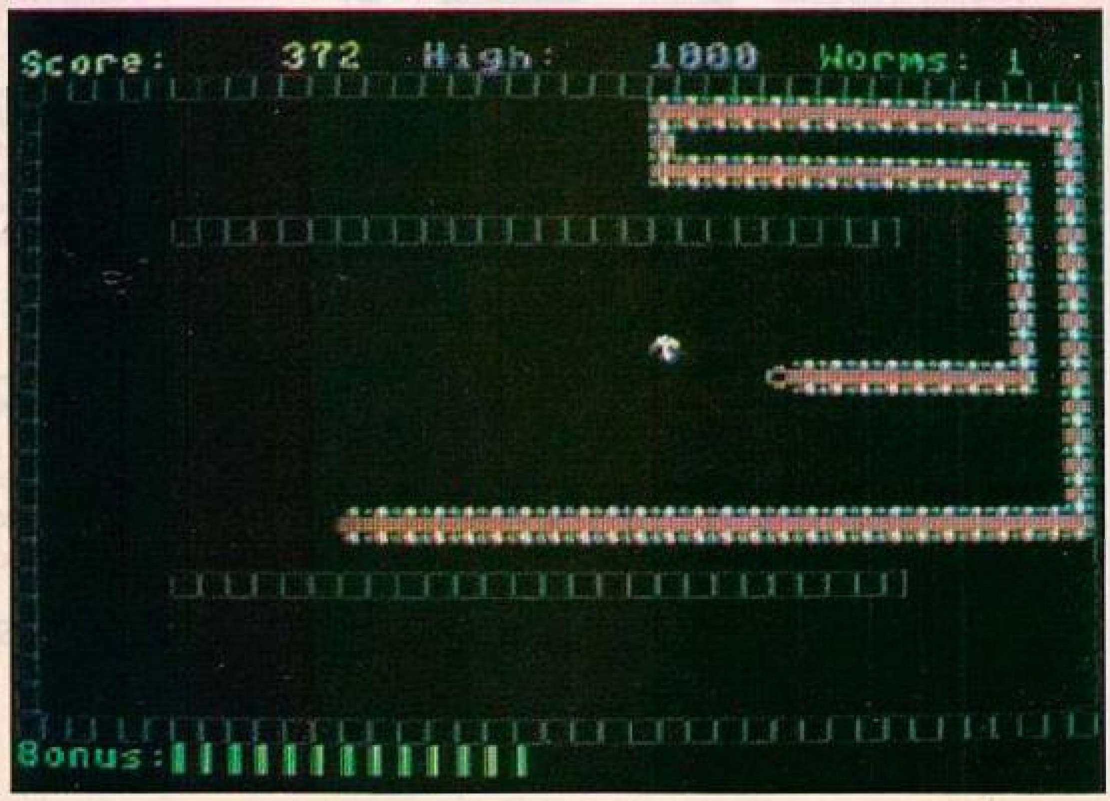
*Table 2.*

| | | | |
|---|---|---|---|
| line 210 | ▌ | is commodore K | |
| line 240 | ▙ | is shift | @ |
| line 1210 | ▬ | is commodore O | |

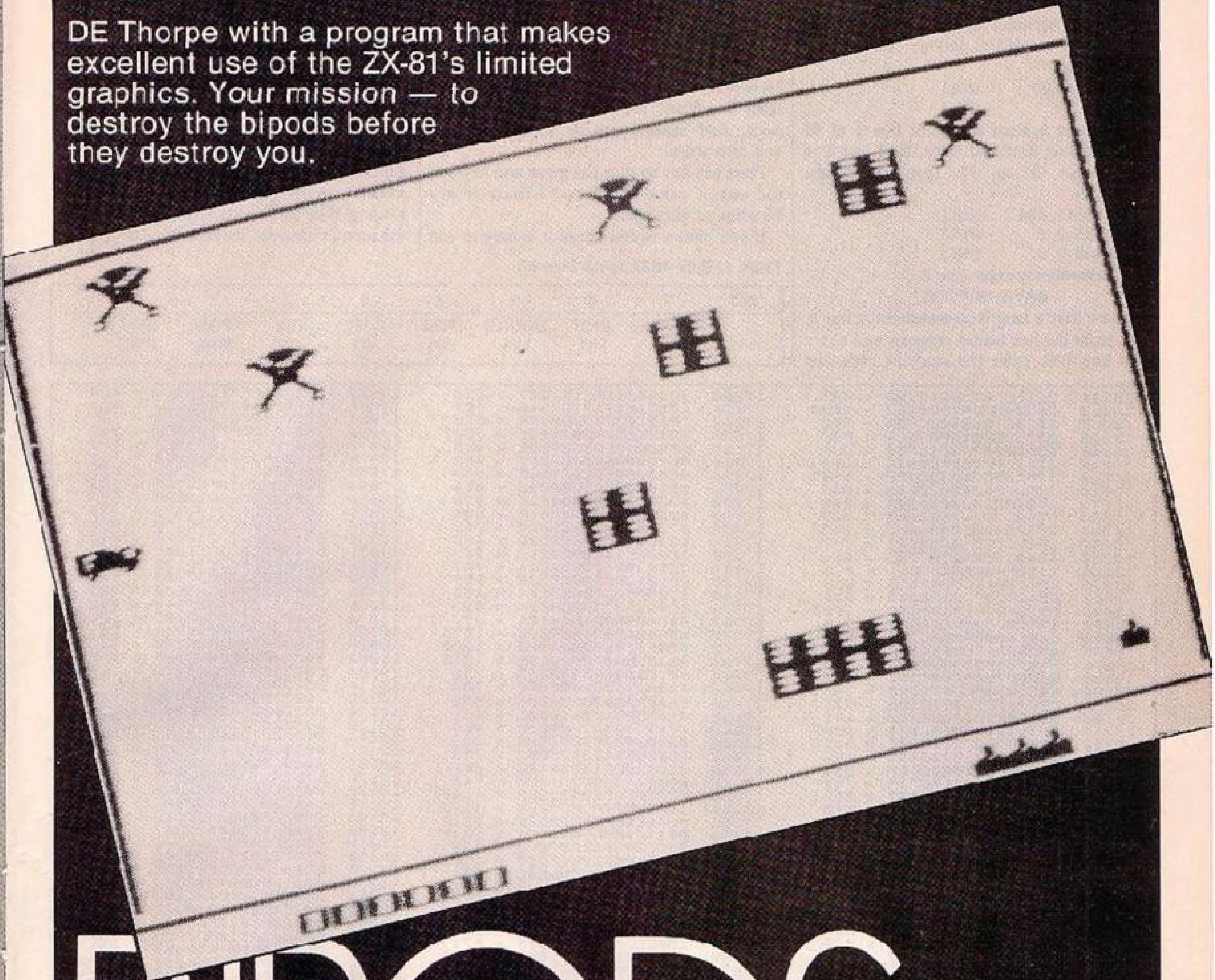
```
1020 POKE56334,PEEK(56334)AND254:POKE1,PEEK(1)AND251
1030 FORI=0TO2047:POKECB+I,PEEK(CR+I):NEXT
1040 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)OR1
1100 FORI=14264TO14335:READB:POKEI,B:NEXT
1200 MC=36864:FORI=MCTOMC+24:READB:POKEI,B:NEXT
1210 FORI=0TO7:READC(I):NEXT
1220 DIMJ(15):FORI=0TO15:READJ(I):NEXT
1230 LL=15:DIMM$(LL):FORI=0TOLL:M$(I)=""
1240 READC:M$(I)=M$(I)+CHR$(C):IFCTHEN1240
1250 NEXT
1260 READC:IFCTHENM1$=M1$+CHR$(C):GOTO1260
1270 READC:IFCTHENM2$=M2$+CHR$(C):GOTO1270
1300 VC=53248:SD=54272:WC=VC+34
1310 POKEVC+17,27:POKEVC+21,0:POKEVC+22,216:POKEVC+26,0:POKEVC+25,11
1320 POKEVC+24,(PEEK(VC+24)AND240)+12
1500 B$="[illegible]":K$="":FORI=1TO40:K$=K$+"[illegible]":NEXT
1510 B$=B$+K$:FORI=1TO21:B$=B$+"[illegible]":NEXT:B$=B$+K$
1520 B$=B$+"[illegible]ONUS:[illegible]":SL$="[illegible]CORE:          [illegible]IGH:          [illegible]ORMS:   "
1600 D(0)=-40:D(1)=1:D(2)=40:D(3)=-1
1610 JP=56320:KB=197:H=251:B=252:C=9:SS=1024:FO=40:E3=247
1620 HI=1000
1630 SP=32:BF=15:MR=250:EX=247
1640 IL$="[illegible]"
1700 FORI=0TO24:POKESD+I,0:NEXT
1710 POKESD+24,15:POKESD+10,8
1720 POKESD+5,2*16+0:POKESD+6,15*16+4
1730 POKESD+12,1*16+0:POKESD+13,15*16+6
1740 POKESD+19,0*16+0:POKESD+20,15*16+0
1750 V1=SD+4:V2=SD+11:V3=SD+18
1780 W1=32:W2=64:W3=32
2000 POKEWC,8:PRINT"[illegible]"TAB(25)"[illegible]"
2010 FORX=1TO27:PRINT"[illegible]"CHR$(20)CHR$(141)"[illegible]"CHR$(148)" ":POKE55416,7
2020 SYS36864:FORJ=1TO70:NEXT:NEXT
2030 FORX=1TO20:PRINT"[illegible]"CHR$(20)CHR$(141)TAB(26)"[illegible]"CHR$(148)" "
2040 SYS36864:FORJ=1TO70:NEXT:NEXT:K$="————————————————"
2050 PRINTTAB(11)"[illegible]"K$"[illegible]"SPC(23)"[illegible]"SPC(15)"[illegible]"SPC(23)"[illegible]"K$"[illegible]"
2060 PRINTTAB(33)"[illegible] BY [illegible] WUDDICK
2070 FORX=1TO20:PRINT"[illegible]"CHR$(20):POKE55615,4:SYS36864:FORJ=1TO70:NEXT:NEXT
2080 PRINT"[illegible]":FORX=5TO-7STEP-1:T=-X*(X>0):Q=7-X*(X<0)
2090 PRINT"[illegible]"TAB(T)RIGHT$("[illegible]",Q)"[illegible] ":SYS36864:FORD=1TO70:NEXT:NEXT
2100 PRINTTAB(12)"[illegible]
2110 PRINT"[illegible] USE A JOYSTICK CONNECTED TO PORT
2120 PRINT"[illegible] NUMBER 2 TO GUIDE WALLY THE WORM
2130 PRINT"[illegible] AROUND THE MAZE TO EAT THE MAGIC
2140 PRINT"[illegible] MUSHROOMS. BE CAREFUL NOT TO LET
2150 PRINT"[illegible] HIM BUMP INTO ANYTHING .... EVEN
2160 PRINT"[illegible] HIMSELF !
2170 PRINT"[illegible] PRESS THE [illegible]" BUTTON TO START
2180 IFPEEK(JP)AND16THEN2180
2999 GOTO10
9000 DATA0,0,0,0,0,0,0,3
9010 DATA85,85,85,85,85,85,85,85
9020 DATA170,130,130,130,130,130,130,170
9030 DATA0,24,118,255,153,24,60,0
9040 DATA0,20,85,65,65,85,20,0
9050 DATA195,20,85,85,85,85,20,195
9060 DATA195,20,85,85,85,85,20,195
9070 DATA195,20,85,85,85,85,20,195
9080 DATA195,20,85,85,85,85,20,195
9100 DATA169,255, 56,237,224, 55,162,3
9110 DATA72,138,10,10,13,168,104,153
9120 DATA224,55,153,231,55,202,16,240
9130 DATA 96
9200 DATA2,10,4,14,6,5,7,8
9300 DATA-1,0,2,-1,3,-1,-1,-1
9310 DATA1,-1,-1,-1,-1,-1,-1,-1
10000 DATA7,32,12,12,0
10010 DATA6,31,6,6,6,31,18,18,0
10020 DATA6,31,8,8,9,9,5,15,0
10030 DATA5,12,5,11,19,34,14,19,21,32,8,0,0
10040 DATA4,7,5,8,18,20,6,9,9,21,14,18,28,38,14,22,0
10050 DATA3,32,6,9,10,13,9,22,20,32,10,14,0
10060 DATA14,39,8,9,1,13,14,15,30,30,14,22,0
10070 DATA3,10,5,14,32,34,9,20,4,31,18,20,19,2,,7,9,0
10080 DATA1,9,2,7,7,38,19,22,10,30,6,7,16,33,1,,14,7,8,12,10,0
10090 DATA1,24,11,13,6,26,5,6,6,26,18,19,25,27,7,17,33,34,8,16,28,32,12,12,0
10100 DATA1,8,13,13,11,14,16,22,24,38,13,15,7,32,2,9,20,34,19,19,0
10110 DATA2,12,3,8,32,33,6,22,6,26,13,14,21,23,2,9,12,17,13,22,0
10120 DATA13,25,2,9,15,23,13,22,5,6,10,11,31,32,12,13
10121 DATA1,8,6,6,27,38,17,18,30,30,8,6,1,10,13,16,0
10130 DATA1,6,7,14,10,38,10,12,31,38,14,22,10,,4,16,22,21,25,10,22,1,31,2,6,0
10140 DATA1,16,2,4,19,29,8,14,8,10,11,22,11,38,21,22,34,38,2,20
10141 DATA1,,18,11,12,1,10,5,6,14,15,16,17,24,25,2,4,0
10150 DATA1,30,2,4,10,38,20,22,10,13,16,19,27,30,5,14,6,20,9,9
10151 DATA2,,26,14,14,1,5,14,15,21,30,17,17,35,35,5,16,0
11000 DATA97,0,10,143,10,10,143,12,10,195,16,38,143,12,13,195,16,20,0
12000 DATA195,15,15,209,18,15,195,16,15,24,14,30,209,13,15,143,12,80,0
```

| | | |
|---|---|---|
| | | needed, increases Wally's length, makes the "eating" noise and awards an extra life is needed. |
| lines | 400-460 | Opens up the exits from the room on the screen and clears the bonus counter from the bottom line. |
| lines | 500-590 | Moves the worm, section by section out of one of the exits and prints message to inform player of next level. |
| lines | 600-699 | Prints a message and makes noises to indicate a collision and a loss of a worm. |
| lines | 700-780 | Game over message and option to play again. |
| lines | 800-849 | Plays fanfare for completion of room. |
| lines | 850-899 | Plays tune at end of game. |
| lines | 900-999 | Draws the current room. |
| lines | 1000-1270 | Redefines the character set including the user defined characters, installs the machine code routine and reads in the remainder of the data into the appropriate variables. |
| lines | 1300-1640 | Set up the video chip and define the remainder of the required variables. |
| lines | 1700-1780 | Set up sound chip and define variables for sound effects. |
| lines | 2000-2999 | Title graphics instructions and wait for fire button to start the game. |
| lines | 9000-9080 | User-defined character data. |
| lines | 9100-9130 | Machine-code routine data. |
| lines | 9200-9310 | Worm colours and joystick to movement conversion data. |
| lines | 10000-10151 | Data for the construction of the 16 rooms. |
| lines | 11000-12000 | Data for the fanfare and the end of program tune. |



DE Thorpe with a program that makes excellent use of the ZX-81's limited graphics. Your mission — to destroy the bipods before they destroy you.



# BIPODS

MARTIAN PODS HAVE landed in your battle zone. At first they are protected by force fields but to attack they divide into deadly Bipods. You must try to destroy them using a missile launcher controlled by the cursor keys.

Don't be too trigger happy — fire is 0 — since there may be a re-loading delay at a crucial moment. The missile launcher will move until the opposite key is pressed to stop or reverse it.

You score 20 points for a bipod and 10 points every time the fuel tanker successfully crosses the screen. There are bonus points at the end of each game level.

*(continued on next page)*

*Hex loader.*

```
 99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GO TO 150
310 NEXT N
```

*(continued from previous page)*

The game occupies just over 2K of machine code and is entered as follows: First, lower RAMtop by:

```
POKE 16389,90      (N/L)
NEW                (N/L)
```

Now enter a Rem statement line 1 of 97 zeros and line 2 of 128 zeros. Edit line 2 to make lines 3 to 17 then enter the commands:

```
POKE 16511, 194    (N/L)
POKE 16512, 8      (N/L)
POKE 16510, 0      (N/L)
```

Now immediately enter line 2:

```
SAVE "BIPODS"
```

You now have a long Rem statement at line 0. Now enter the hex loader program and run it from line 100, enter the machine code and when finished, add the following Basic lines:

```
5 RAND USR 16592
8 STOP
```

Now save the program before running it. Run from line 5 and the screen should show the pods, fuel tanker, missile units, obstacles and zero score.

Press any key to start the game and key S at the end of game to return to Basic or key Newline to play again.

If you have a sound board it is easy to add sound to this game. There is space to add to your machine-code sound routines after the main program and these can be called from:

```
40d0   to set up the sound registers
4115   to produce the sounds.
```

The sounds to be produced are indicated by Bits being set in Byte 4021. After creating a sound the relevant Bits must be reset. If your generator uses the AY-3-8910 sound chip the sounds can be produced simultaneously by loading Byte 4021 into Register 7 to enable the sound channels. See table 1. ■

*Table 1: Byte 4021 comprises of:*

| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| | SPARE | UNIT HIT | BOUND HIT | POD HIT | FUEL HIT | DIVIDE | POD FIRE | UNIT FIRE |

```
16514: 3E1EED47DD218102 = 785
16522: C93E08ED47DD21A7 = 1000
16530: 40C921005A0EC006 = 600
16538: 20369E2310FB36C9 = 801
16546: 23002AF3C921DFD9 = 997
16554: 112100F30EFE0616 = 539
16562: 10FE06D0ED78D3FF = 1291
16570: 13CDCF4005C2B040 = 946
16578: CD9202CD2002DD21 = 846
16586: A740C36147E9CD05 = 827
16594: 00CD9440CD8B40CD = 1030
16602: CD42CDCF42000C21 = 737
16610: 404011EB421A7723 = 626
16618: 1310FA3A4A403251 = 612
16626: 42CD5042CD0A44CD = 905
16634: DE42CD3745CD0042 = 888
16642: CD7C423A2540FEFF = 1062
16650: 28F6CDB3450603C5 = 949
16658: CD9648000000CDC3 = 827
16666: 45CD9047CDB645CD = 1163
16674: F447C10578C5FE01 = 1088
16682: 28EDB7280C00C336 = 770
16690: 44CD0545CD474518 = 716
16698: D7061EE100775E23 = 532
16706: 561AFE1220321018 = 481
16714: F5181300E5EBCDF0 = 1197
16722: 45E18728F1E11202 = 841
16730: 3E1D127028713A34 = 457
16738: 40E60FB72003CDB3 = 911
16746: 453A3440CB07E51F = 715
16754: CB2716005FE10077 = 511
16762: 195E23561AFE1220 = 570
16770: 63E8CDF046E7CAE8 = 1466
16778: 41EB197EFE122355 = 846
16786: FE1F2804FE2020F2 = 889
16794: E37CB728167D1E8E = 901
16802: FE0282221E10FEFF = 1107
16810: 23101CFEDF28171E = 665
16818: 9118137D1E0EFE01 = 612
16826: 23001CFE2180071E = 444
16834: 3FFE2228011C3A45 = 627
16842: 40FE0A2817C5E173 = 928
16850: FDCB21CEEB2A4340 = 1103
16858: 2323224347323272 = 499
16866: 214540341810ED5B = 586
16874: 3240A7ED522007EB = 884
16882: 3508FDCB21F6C1C3 = 1185
16890: 0E41000000002A0C = 134
16898: 40062023361F10FB = 489
16906: 1121000518193620 = 189
16914: 10F8061F361F2B10 = 448
16922: F5361F1370019D15 = 858
16930: 19362010FBC90000 = 579
16938: 0000250054005E00 = 215
16946: AD000101D7012B02 = 436
16954: 7E021402A1007000 = 424
16962: A5010502BC009802 = 513
16970: 8102A8001D020604 = 349
16978: ED5B2C422A0D4019 = 581
16986: 3501230502112100 = 196
16994: 1936042B3603ED5B = 511
17002: 54421313EDE35442 = 658
17010: 1DE112C42ED5354C = 769
17018: 42C90618ED5B0C40 = 701
17026: 21FF5913231AB728 = 680
17034: F3FE762805CD9D42 = 1095
17042: 13F1D511E70019D1 = 980
17050: 13E9CDCD5DEBED21 = 1351
17058: F84206074F8110FD = 804
17066: 4F09EB0608E11977 = 707
17074: 13D5112100190110 = 532
17082: F5E1D1C1C9000506 = 1085
17090: 2A0C4011FC021323 = 449
17098: 381310FBC906032A = 592
17106: 0C40110F03192336 = 225
17114: 0A10FBC92A0C4011 = 613
17122: 820219360A223C40 = 427
17130: C99E7700E0770000 = 821
17138: 0000770400000000 = 123
17146: 0000000000000217 = 57
17154: 8DB62417292297A2 = 816
17162: BDAC20A2A2972222 = 936
17170: 363D2C9710979797 = 792
17178: 2C3D362299221EA0 = 570
17186: 1EA01EA01E1E1E9F = 629
17194: 9DAC9D1EB72C9EB9 = 1056
17202: B5BE3232983D0807 = 692
17210: 020F0B0D0E089E05 = 227
17218: 0E122D2E35313D30 = 356
17226: 3D141E1E1E1E2217 = 258
17234: 171E1E1717221E1E = 223
17242: 1E1E143D3D3D97F2 = 576
17250: A21E1EA2A2979E9E = 1010
17258: 9E00009E9E9E9E9E = 948
17266: 9E00009E9E9E9E9E = 943
17274: 9E00009E9E9E9E9E = 948
17282: 9E00009E9E9E201E = 694
17290: A0203DBDA0A09E32 = 970
17298: 33333333329E9E1F = 601
17306: B73D3D3D209E9E20 = 746
17314: 151C241D249E9E20 = 490
17322: BE29BE15209E9E99 = 943
17330: 36E81524999E9E24 = 800
17338: 1D201CBE209E9E20 = 659
17346: 1D200300209E9E24 = 401
17354: 1C992A3D3D9E9E24 = 697
17362: A524A5A5249E9E24 = 916
17370: A5A52482249E9E9E = 1054
17378: 9E9E9E9E9E9EA0A0 = 1068
17386: A01E1EA0A0A09E9E = 1016
17394: 9E1E1E9E9E9E1313 = 730
17402: 161A131300006802 = 200
17410: 6802FA007C009C01 = 635
17418: 0605ED5B0E442A0C = 461
17426: 4019350523360511 = 255
17434: 21001936052B3605 = 219
17442: ED5B0E441213ED53 = 700
17450: 0E4410DE110044ED = 642
17458: 530E44C92F2540EB = 744
17466: A721F7DFED52CAE5 = 1420
17474: 4421EFF7A7ED520A = 1275
17482: F54421EFEFA7ED52 = 1310
17490: 281421EFDFA7ED52 = 1041
17498: 28652A3C40CB7EC8 = 836
17506: FDCB4C4020097DCD = 1101
17514: 4E46280AFDCB4E86 = 866
17522: 2A3C40CBBEC92A3C = 862
17530: 40CBFE7EFE8A281A = 1105
17538: FE8C2800FE082805 = 886
17546: E523E51313E52BE5 = 1037
17554: 180EE511210019E5 = 571
17562: 1806E511DFFF19E5 = 1008
17570: E17EFE00200AD11A = 662
17578: 77223C403E1D12C9 = 587
17586: 3FFE1D20F10020D1 = 836
17594: C9FDCB21F618E7FD = 1444
17602: CB4E40200AFDCB4E = 927
17610: C62A3C40CBBEC92A = 1000
17618: 3C40CBFE7EFE3A28 = 1139
17626: 39FE0C280DFE3B28 = 1241
17634: A7C3AA2A3C407EE6 = 883
17642: 7FFE0D280234C935 = 742
17650: 3535C92A3C407EE6 = 829
17658: 7FFE0A2004343434 = 583
17666: C935C92A3E40237E = 784
17674: FE20281EB7280DFD = 845
17682: CB21DE3E08772B77 = 809
17690: 2B7718172B2B361D = 378
17698: 233608233607E23E = 287
17706: 40C92B361D2B361D = 517
17714: FD344D00002A3C40 = 500
17722: 114C011936062336 = 266
17730: 07223E40C92A2540 = 511
17738: EBA721EFFDED52C0 = 1436
17746: FDCB21C62A3C407E = 979
17754: E67FFE0A2812FE0C = 945
17762: 2816FE082805230E = 421
17770: 0E1813280E10180E = 168
17778: 11DFFF190E111806 = 581
17786: 112100190E0F7EFE = 484
17794: 20280EFE1D280A3F = 450
17802: FE0AD83FFE133819 = 897
17810: C93A4240FE0AC871 = 966
17818: EB2A404020232240 = 573
17826: 4073237221421034 = 543
17834: C9FDCB4EDE7E00C9 = 1284
17842: D1C38546214340E5 = 1000
17850: 01454021E277E518 = 765
17858: 08214040E5014240 = 532
17866: 21A077E50AED4346 = 925
17874: 10B72003E1E1C947 = 1004
17882: 5E2356D51A4FE67F = 890
17890: FE0E2816FE0F281C = 667
17898: FE102822FE1120C0 = 839
17906: CB79203621DFFF19 = 946
17914: 1834CB79201A2101 = 492
17922: 2019182ACB792016 = 489
17930: 212100191820CB79 = 471
17938: 201221FFFF191315 = 684
17946: 21E0FF1918102122 = 644
17954: 0019180A21200019 = 149
17962: 180421DEFF197EFE = 940
17970: 00282CFE1D2828E6 = 677
17978: 7FFE0A2825FE0828 = 773
17986: 21FE0C2810FE0D28 = 675
17994: 10FE062010FE0728 = 655
18002: 1CFE122820D13E08 = 654
18010: 12FDCB21EE182471 = 918
18018: 180C3608FDCB21F6 = 849
18026: 18143608C0360828 = 245
18034: 3608FDCB21DE1806 = 803
18042: 3608FDCB4EE6D13E = 1097
18050: 1D12EBE173237223 = 806
18058: E505C2D0451DFE00 = 906
18066: 200CE1E13535ED48 = 912
18074: 4640C5E135C9E1E1 = 1260
18082: C9A949AA7FB9AD84 = 1278
18090: 8725FA5B0DA5A4A0 = 1271
18098: 643A4A40FE00C85F = 945
18106: CB231600212A4219 = 426
18114: 5E23562A0C401936 = 412
18122: 1D23361D11210019 = 222
18130: 3612283512E82A48 = 536
18138: 4073237213237323 = 532
18146: 72232243403D324A = 504
18154: 40FDCB21D6C9E5CD = 1402
18162: 3047C52A3C40CD30 = 735
18170: 47D1A7732A3440CB = 928
18178: 45280CBA38042803 = 410
18186: 111115C34D280AA7 = 553
18194: 79BB380128031C1C = 487
18202: 1DD5C1C34A477EB7 = 1094
18210: 2803D1AFC9444DA7 = 940
18218: D1FD523F01C9FD5A = 1120
18226: 0C4013A7ED521121 = 531
18234: 00010000A704ED52 = 491
18242: 30FB05127D4FC900 = 734
18250: 2A0C40231121007A = 323
18258: B728031310FD79B7 = 824
18266: 2804412310FDC906 = 620
18274: 003A4D40B7280547 = 498
18282: AF324D40FDCB4F66 = 1002
18290: 280AFDCB4EA6FDCB = 1205
18298: 21E63C3C8047B728 = 805
18306: 172A0C4011010319 = 187
18314: E57E3CFE1D200536 = 780
18322: 132B18F577E110F0 = 931
18330: C3A402CDB1470601 = 821
18338: 2A0C4011F80219E8 = 545
18346: 218871C3C847C901 = 1011
18354: 06152A0C40112200 = 196
18362: 19EB21035B120ACD = 631
18370: 9D421AFE1D2E1BAF = 766
18378: 121323178039FDFE = 843
18386: 202804FE7620E8D5 = 925
18394: 11E90013D1131310 = 538
18402: E8C9FE0320033C18 = 811
18410: 06FE0920DC3E1C12 = 630
18418: 18D72A3C407EFE09 = 794
18426: 201CCD3A4806032A = 526
18434: 0C40111203197EFE = 519
18442: 0A28052210F3182E = 432
18450: 361DCDDE42C9061F = 814
18458: 2100775E23561AFE = 647
18466: 1228092310F53A4A = 495
18474: 108723222A3E407E = 525
18482: FE092803237EFE08 = 732
18490: 2003CD3745C90606 = 577
18498: 2A0C4011FD021911 = 432
18506: F8431ABEDAAB4820 = 1024
18514: 04231313F5C3B148 = 763
18522: 3A5142FE12280300 = 520
18530: 3C3C324A40CD8A48 = 723
18538: 06162A0C40237EFE = 561
18546: 762804350018F810 = 502
18554: F4E1E13E1E324D40 = 977
18562: CD9440050AC3E140 = 917
18570: 3E643231403A3440 = 502
18578: B720FAC2FDCB4E5E = 1294
18586: 280EFDCB4E9EFE12 = 1016
18594: 2004FDCB4EE53603 = 862
18602: C97E12231310FA06 = 671
18610: 062A0C4011080319 = 177
18618: 11F843331E233620 = 537
18626: 23231A77231310FA = 535
18634: F1F1CD7C42CD2A0A = 1102
18642: 3A2540FEBFCFD040 = 1078
18650: FEFD20F4CD8240C9 = 1383
```

# SNAKY

M. North squirms his way around a Dragon's hires screen.

*Basic loader.*

```
5 REM HEX LOADER
10 REM TYPE PCLEAR8 BEFORE ENTERING THIS LISTING
20 FOR N=8001 TO 10877 STEP 8
30 SUM=0
40 PRINT N;": ";
50 INPUT A$
60 PRINT A$;"= ";
70 INPUT TT
80 PRINT TT
90 Z=0
100 FOR K=1 TO LEN(A$) STEP 2
110 C=VAL("&H" + MID$(A$,K,2))
120 SUM=SUM+C
130 POKE N+Z,C
140 Z=Z+1
150 NEXT K
160 IF SUM=TT THEN GOTO 190
170 PRINT "ERROR - PLEASE INPUT AGAIN"
180 GOTO 30
190 NEXT N
```

THE IDEA OF THIS game for the Dragon 32 or 64 in 32K mode is that you control a snake moving around the screen, eating grubs and beetles but avoiding the poisonous mushrooms. The snake is controlled by the right hand joystick and full instructions are included in the game.

## Written in machine code

The game is written entirely in 6809 machine code and can be entered in the following way:

First type in: PCLEAR8

then type in the Basic loader and use it to enter the machine code directly into memory. At the first input prompt enter the string of hex digits and follow it with the checksum.

When the program is correctly entered save it by typing

CSAVEM "SNAKEY", &H1F41, &H2A7E, &H2566

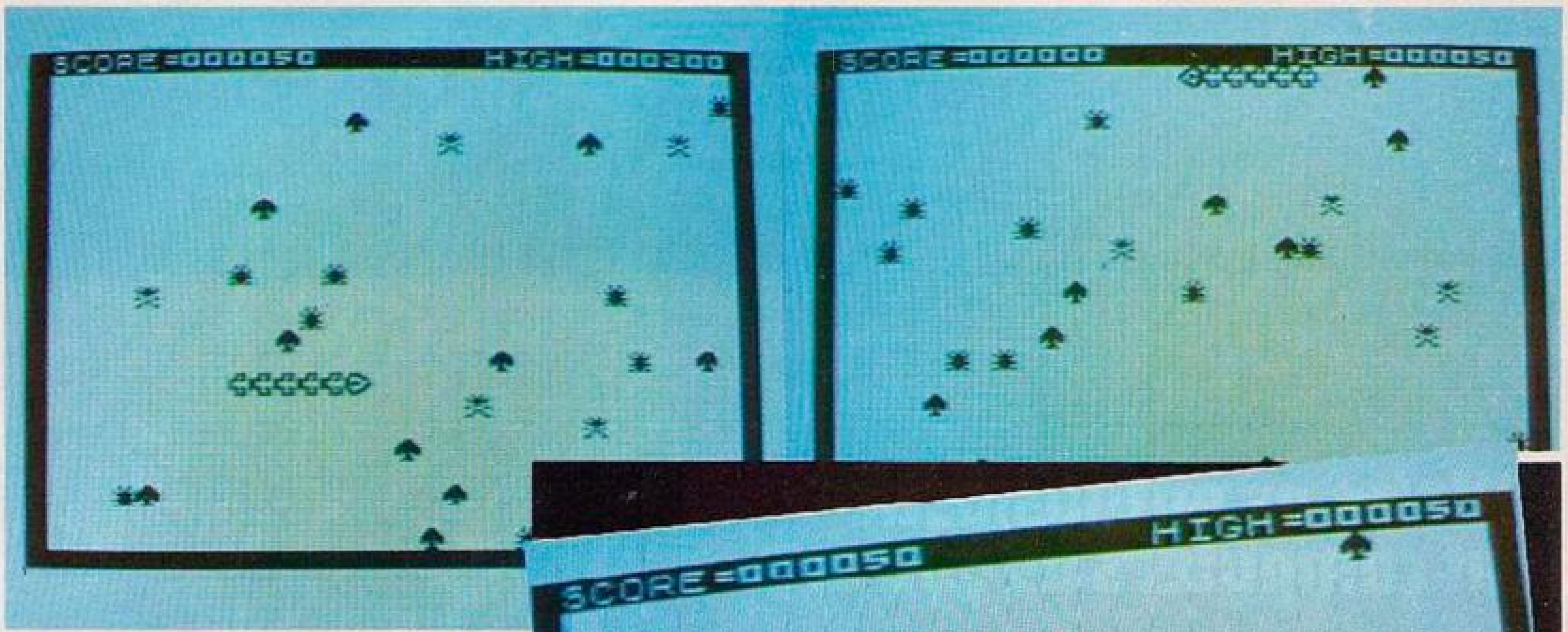
Do not attempt to run the program before saving it since the checksum is not perfect.

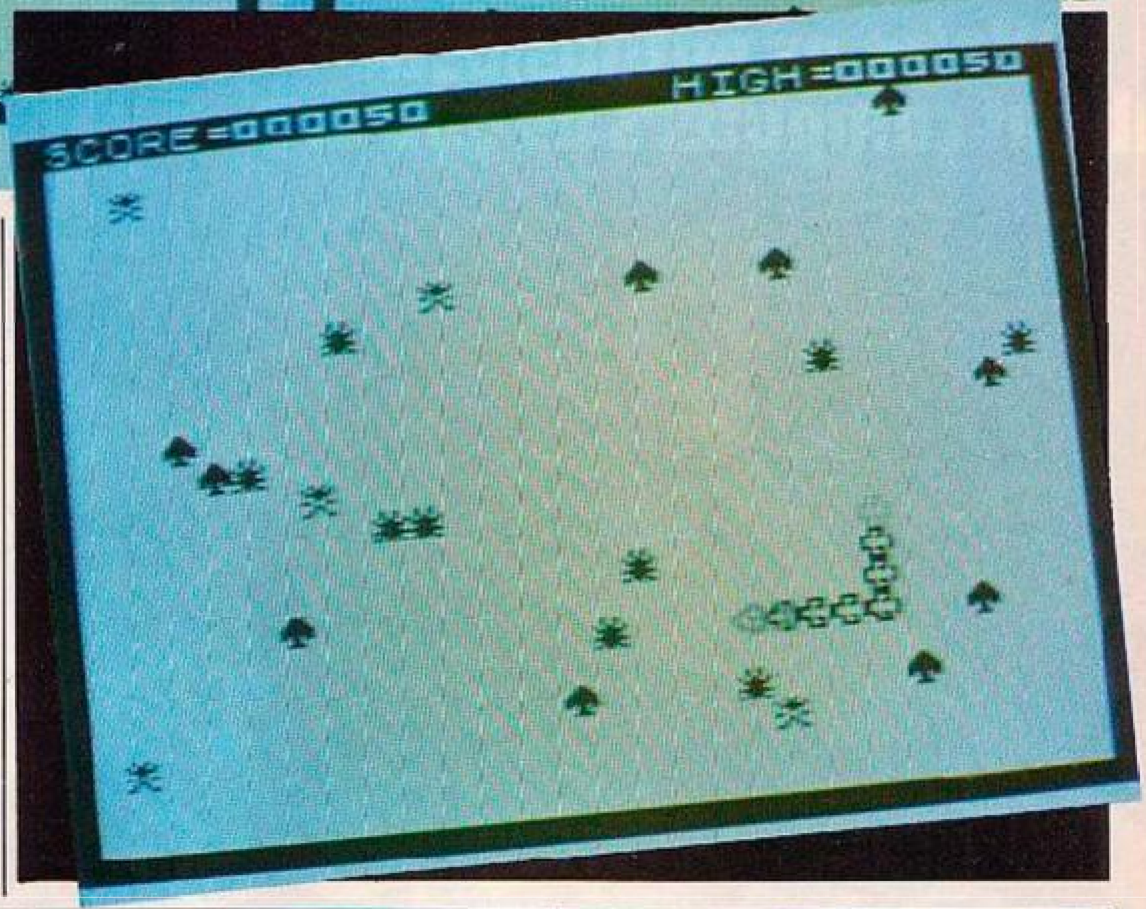
If you find the game too easy or too easy, you might like to change the following addresses:

| ADDRESSES | PURPOSE | DEFAULT | COMMENTS |
|---|---|---|---|
| &H26A8 | initial no. of grubs and mushrooms | 10 | |

*Snaky machine code.*

```
8001 : 342C3100312C3100 = 287
8009 : 3100224240372C38 = 381
8017 : 3843303852323431 = 466
8025 : 4431373742323431 = 454
8033 : 5531373722002831 = 367
8041 : 2C31292C302C3000 = 318
8049 : F1C49E32729EC4F1 = 1354
8057 : 8F23794E4C79238F = 752
8065 : 813C6624809903E7 = 1111
8073 : E703998D24663C81 = 1111
8081 : C3D8127E7E1208C3 = 1116
8089 : E7C381000024E7C3 = 1017
8097 : DBD866B1C300C324 = 1095
8105 : DB6681E73CE7D03C = 1251
8113 : FCCCCCCCFCF03030 = 1452
8121 : 30FCFC0C3CC0FCFC = 1320
8129 : 0C3C0CFC0C3CCCFC = 864
8137 : 0CFCC0FC0CFCFCC0 = 1404
8145 : FCCCFCFCCCC0C3030 = 1272
8153 : FCCCFCCCFCFCCCFC = 1872
8161 : 0C303C403C02423C = 372
8169 : 3C424040423C3C42 = 506
8177 : 4242423C7C42427C = 638
8185 : 44427E407C40407E = 702
8193 : 003E003E00004242 = 256
8201 : 7E4242423E080808 = 410
8209 : 083E3C42404E423C = 464
8217 : 42427E424242003E = 518
8225 : 003F000012345600 = 218
8233 : 0050000100999990 = 531
8241 : 444F20594F552052 = 546
8249 : 4551554952452049 = 564
8257 : 4E53545255435449 = 636
8265 : 4F4E533F50524553 = 617
8273 : 53204A4F59535449 = 597
8281 : 434842555454544F4E = 618
8289 : 20544F2053544152 = 541
8297 : 5420594F55204152 = 548
8305 : 45204120534E4148 = 499
8313 : 4520494E204F5244 = 525
8321 : 455220544F202020 = 442
8329 : 2053555256495645 = 596
8337 : 20594F5520405553 = 562
8345 : 542045415420544B = 522
8353 : 4520475255425320 = 520
8361 : 20414E4420424545 = 479
8369 : 544C45532E425554 = 593
8377 : 20444F204E4F5420 = 484
8385 : 4541542054484520 = 507
8393 : 204D555348524F4F = 589
8401 : 4D532C5448455920 = 550
8409 : 4152452050 4F4953 = 563
8417 : 4F4E4F5553204 14E = 579
8425 : 4457494C4C204849 = 560
8433 : 4C4C20594F552049 = 547
8441 : 4E53544 14E544C59 = 637
8449 : 2E54484520202020 = 399
8457 : 204649454C442059 = 509
8465 : 4F5520415245204 9 = 517
8473 : 4E20495320535552 = 548
8481 : 524F554E44454420 = 561
8489 : 20425920414E2045 = 463
8497 : 4C454354524943 20 = 550
8505 : 46454E4345204 14E = 528
8513 : 4420202020202020 = 292
8521 : 20544F5543484 94E = 570
8529 : 472049542057494C = 528
8537 : 4C20434155534520 = 509
8545 : 594F555220202020 = 463
8553 : 20534 34F52452054 = 528
8561 : 4F20444543524541 = 531
8569 : 5345205241504944 = 552
8577 : 4C592E5448452020 = 500
8585 : 2053414E44203448 = 514
8593 : 494E472048415050 = 551
8601 : 454E532C49462059 = 526
8609 : 4F55202020202020 = 356
8617 : 20414E4544434D5054 = 575
8625 : 20544F2C4D4F5645 = 538
8633 : 204144444143454E = 518
8641 : 5420544F20594F55 = 564
8649 : 52424F44592E2049 = 535
8657 : 4620594F55205354 = 554
8665 : 4F5020594F552057 = 563
8673 : 494C4C2044494520 = 499
8681 : 2C4F462053544152 = 527
8689 : 564154494F4E2E20 = 543
8697 : 454154494E472041 = 537
8705 : 2C47525542202020 = 432
8713 : 2043415553455320 = 516
8721 : 594F555220424F44 = 580
8729 : 5920544F20494E43 = 534
8737 : 5245415345204259 = 555
8745 : 203120554E495420 = 465
8753 : 414E442041204245 = 475
8761 : 45544C4520425920 = 517
8769 : 3220554E49545320 = 517
8777 : 2020202020202020 = 256
8785 : 505245535320414E = 572
8793 : 59204B45592E2020 = 464
8801 : 2020202020202020 = 256
8809 : 202020494620594F = 439
8817 : 5520454154204 14C = 508
8825 : 4C20544845204 64F = 514
8833 : 4F44204F4E205448 = 524
8841 : 452053435245454E = 549
8849 : 2C54484520534E41 = 527
8857 : 4B45205749 4C4C20 = 520
8865 : 53544F5020414E44 = 569
8873 : 2020505245535349 = 534
8881 : 4E47205448452046 = 508
8889 : 4952452042555454 = 575
8897 : 4F4E202020202020 = 349
8905 : 202047454E455241 = 498
8913 : 54455320404D4F52 45 = 575
8921 : 20464F4F44204255 = 511
8929 : 5420414C534F2020 = 483
8937 : 20204D4F5245204D = 480
8945 : 5553485224F4F4D53 = 640
8953 : 2E20594F55522053 = 528
8961 : 504545442041 4C53 = 542
8969 : 4F20494E43524541 = 545
8977 : 5345532057495448 = 583
8985 : 2020454143482053 = 452
8993 : 435245454E2E2054 = 527
9001 : 48455534E41484520 = 543
9009 : 495320434F4E5452 = 578
9017 : 4F4C454420425920 = 511
9025 : 5448452020524947 = 515
9033 : 48544841 4E44204A = 545
9041 : 4F5953544943 4B2E = 596
9049 : 000000FF00FF00EF = 749
9057 : 00EF00EF00EF00EF = 956
9065 : 00EF00EF00EF00EF = 956
9073 : 00EF00EF00EF00EF = 956
9081 : 00EF00EF00EF00FF = 972
9089 : 00FF00FF00FF00FF = 1020
9097 : 00FF00FF00FF00FF = 1020
9105 : 00FF00FF00FF00FF = 1020
9113 : 00FF00FF00FF00FF = 1020
9121 : 00FF00FF00FF00FF = 1020
9129 : 00FF00FF00FF00FF = 1020
9137 : 00FF00FF00FF00FF = 1020
9145 : 00FF00FF00FF00FF = 1020
9153 : 00FF00FF00FF00FF = 1020
9161 : 00FF00FF00FF00FF = 1020
9169 : 00FF00FF00FF00FF = 1020
9177 : 00FF00FF00FF00EF = 1004
9185 : 00EF00EF00EF00EF = 956
9193 : 00EF00EF00EF00EF = 956
9201 : 00EF00EF00EF00EF = 956
9209 : 00EF00EF00EF00FF = 972
9217 : 00FF00FF00FF00FF = 1020
9225 : 00FF00FF00FF00FF = 1020
9233 : 00FF00FF00FF00FF = 1020
9241 : 00FF00FF00FF00FF = 1020
9249 : 00FF00FF00FF00FF = 1020
9257 : 00FF00FF00FF00FF = 1020
9265 : 00FF00FF00FF00FF = 1020
9273 : 00FF00FF00FF00FF = 1020
9281 : 00FF00FF00FF00FF = 1020
9289 : 00FF00FF00FF00FF = 1020
9297 : 00FF00FF00FF00FF = 1020
9305 : 00FF00FF00FF00EF = 1004
9313 : 00EF00EF00EF00EF = 956
9321 : 00EF00EF00EF00EF = 956
9329 : 00EF00EF00EF00EF = 956
9337 : 00EF00EF00EF00FF = 972
9345 : 00FF00FF00FF00FF = 1020
9353 : 00FF00FF00FF00FF = 1020
9361 : 00FF00FF00FF00FF = 1020
9369 : 00FF00FF00FF00FF = 1020
9377 : 00FF00FF00FF00FF = 1020
9385 : 00FF00FF00FF00FF = 1020
9393 : 00FF00FF00FF00FF = 1020
9401 : 00FF00FF00FF00FF = 1020
9409 : 00FF00FF00FF00FF = 1020
9417 : 00FF00FF00FF00FF = 1020
9425 : 00FF00FF00FF00FF = 1020
9433 : 00FF00FF00EF00EF = 1004
```

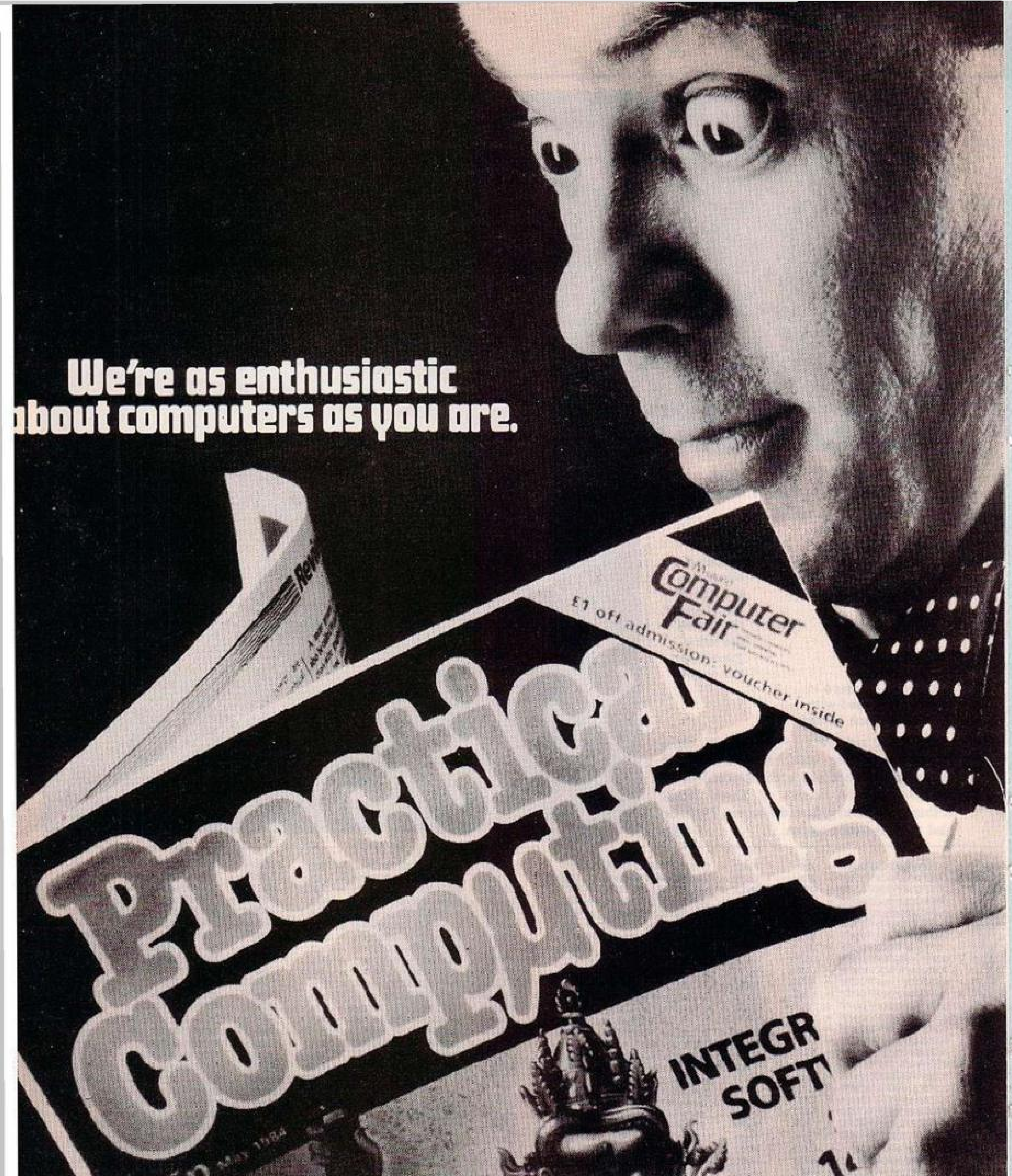



| ADDRESSES | PURPOSE | DEFAULT | COMMENTS |
|---|---|---|---|
| &H25B0 | initial no. of beatles | 5 | |
| &H25B5 | total no. of grubs + beatles | 15 | must be adjusted if either of the above are changed |
| &H25BD | speed control | 140 | the higher the value the slower the speed |
| &H2564 | increase in speed with each screen | 3 | |

If you do not want to stay up all night typing in all the code, send a stamped addressed envelope and a check/postal order for £3.00 to M. North, 7 Essex Road, Rishton, Blackburn, Lancashire and I will be glad to send a copy to you. ■

```
9441 : 00EF00EF00EF00EF = 956
9449 : 00EF00EF00EF00EF = 956
9457 : 00EF00EF00EF00EF = 956
9465 : 00EF00EF00EF00FF = 972
9473 : 00FF00FF00FF00FF = 1020
9481 : 00FF00FF00FF00FF = 1020
9489 : 00FF00FF00FF00FF = 1020
9497 : 00FF00FF00FF00FF = 1020
9505 : 00FF00FF00FF00FF = 1020
9513 : 00FF00FF00FF00FF = 1020
9521 : 00FF00FF00FF00FF = 1020
9529 : 00FF00FF00FF00FF = 1020
9537 : 00FF00FF00FF00FF = 1020
9545 : 00FF00FF00FF00FF = 1020
9553 : 00FF00FF00FF00FF = 1020
9561 : 000000FF00FF00EF = 749
9569 : 002EE003EB:70477 = 651
9577 : BE04223:BDFAC1A6 = 979
9585 : A0BA40A7B0BC043E = 863
9593 : 26F3CC0000DB8BD = 1033
9601 : A0EA815910270464 = 771
9609 : CC0730EDBDFDCCED = 1331
9617 : BDFDCAB606A7BDFD = 1297
9625 : C6CC0735EDBDFDC0 = 1285
9633 : CC236DEDBCB0B60A = 1045
9641 : A7BCAFA7BCADB605 = 1101
9649 : A7BCA9B60FA7BCA5 = 1097
9657 : CC2EE0EDBCA36FBC = 1265
9665 : 9DBE20254F5FEDB1 = 908
9673 : A7B44CA7BC91B6FF = 1264
9681 : 0184F7B7FF01B6FF = 1256
9689 : 0384F7B7FF03B63F = 1020
9697 : B7FF2310BE00A630 = 845
9705 : BDF955AFA4BDA9AF = 1347
9713 : 30BDF954AFA4BDA8 = 1218
9721 : C030BDF94DAFA4BD = 1235
9729 : B05130BDF96010BE = 949
9737 : 00A6AFA4BDACB717 = 1024
9745 : 025B3601BE000BEE = 616
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9777 : E3CE0006BE1FE310 = 855
9785 : BE0641170306CE00 = 659
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10081 : A7BDFDFB17010616 = 864
10089 : FF90AEBDFBED3189 = 1388
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10105 : BDFDE41700EF16FF = 1161
10113 : 79351081E7273981 = 775
10121 : C32735B1D8102700 = 690
10129 : 05B100271316FF62 = 700
10137 : 3510BE2025260586 = 553
10145 : 2027271CBE202E17 = 381
10153 : 01E916FF40BE2025 = 847
10161 : 2605B62027230498E = 482
10169 : 202E1701D616FF3A = 651
10177 : BE2025C60310BE23 = 605
10185 : 59A680A1A025152E = 808
10193 : 035A26F5BE2025C6 = 785
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10393 : 0226061 08E1F7920 = 388
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10417 : A0E7843088204026 = 851
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10473 : 02BF2557BE2361AF = 814
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10489 : BE2361A784308820 = 837
10497 : 5A26FB39FC2559BB = 998
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10521 : 2339041F811E2CE4 = 720
10529 : 810623F0C41FC300 = 316
10537 : 201F01A68481FF26 = 784
10545 : B339860FB7255EB6 = 965
10553 : 0AB7255BB7255CB6 = 767
10561 : 05B7255DFC256227 = 744
10569 : 06B32564FD256216 = 732
10577 : FD3CA6A481C32605 = 1010
10585 : 351016FE63A62181 = 772
10593 : C31027FE33A63F81 = 913
10601 : C31027FE2BA6A901 = 883
10609 : 0081C31027FE21A6 = 832
10617 : A9FF00E1C31027FE = 1057
10625 : 17A6A481FF1026FD = 1044
10633 : FBAFBDF9D010AF8D = 1353
10641 : F9C939CE2025C603 = 983
10649 : 33C530851CFEA6C2 = 1071
10657 : A98219A7C45A26F6 = 1061
10665 : 8E0647CE2025C603 = 695
10673 : A6C4444444448D0E = 789
10681 : 3001A6C0840F8D06 = 701
10689 : 30015A26EB393456 = 607
10697 : C6053D33BDF5E133 = 977
10705 : CBC605A6C04784 30 = 1111
10713 : 8B205A26F635D68E = 951
10721 : C4008 6BFA780BC06 = 722
10729 : 0126F939BE040010 = 507
10737 : BE206AA6A08A40A7 = 975
10745 : B08C060126F5BDA0 = 907
10753 : EA8DDC8E0400A6A0 = 1067
10761 : 8A40A7B08C04EE26 = 917
10769 : F516FB74C606A680 = 1132
10777 : A7A431AB205A26F6 = 954
10785 : 335E31A9FFA11183 = 832
10793 : 000026EB397F2561 = 588
10801 : 7C2561F625615A26 = 766
10809 : FD8628B7FF24F625 = 1184
10817 : 615A26FD4FD7FF24 = 1031
10825 : E1256126E339C6FF = 1086
10833 : F725617A2561F625 = 920
10841 : 615A26FD8628B7FF = 1090
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10873 : FF4A26FD39 = 677
```

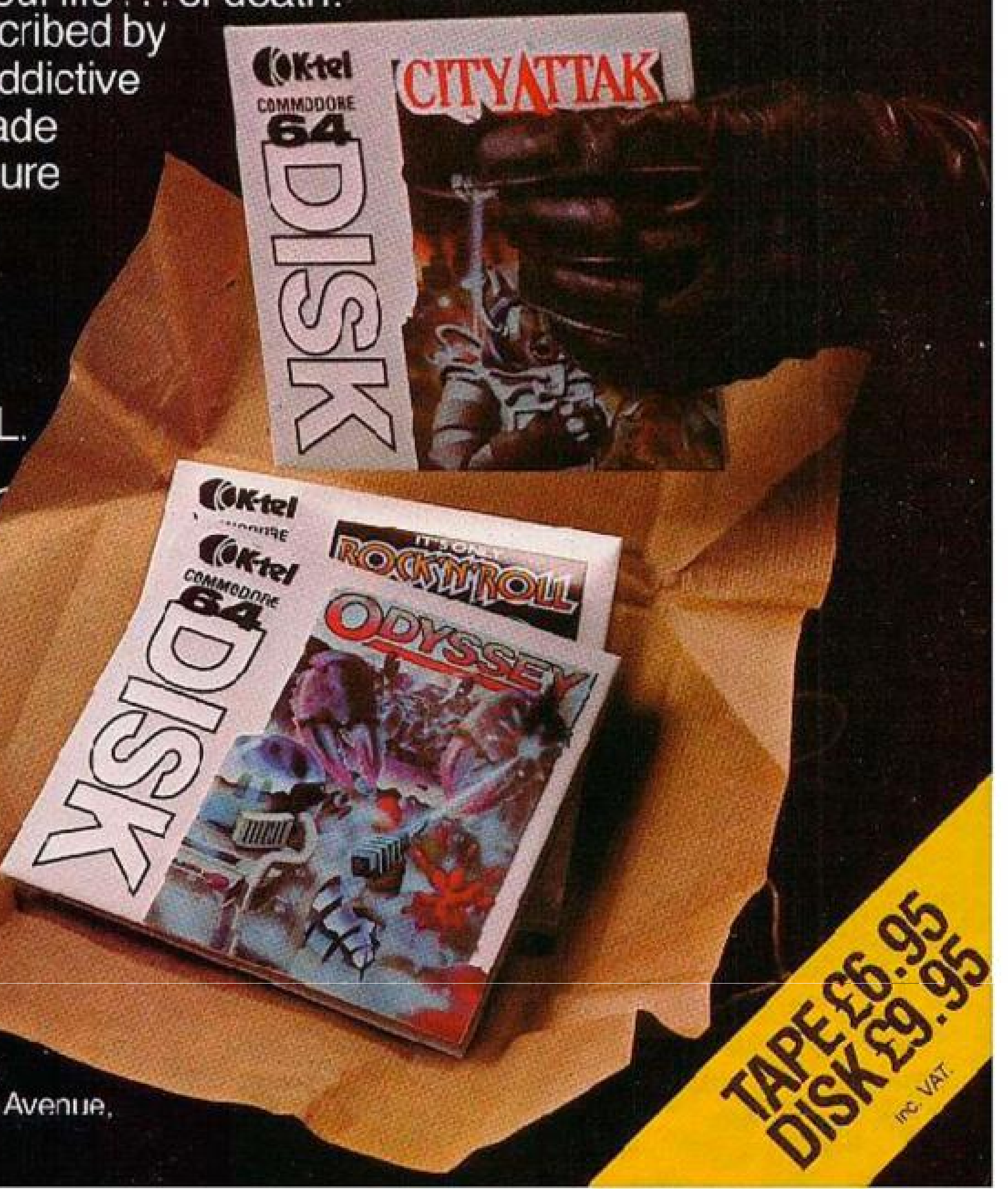

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s become.

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Remember the days when every record player was gifted with a needle instead of a stylus. 45's were "in," 78's were "out."

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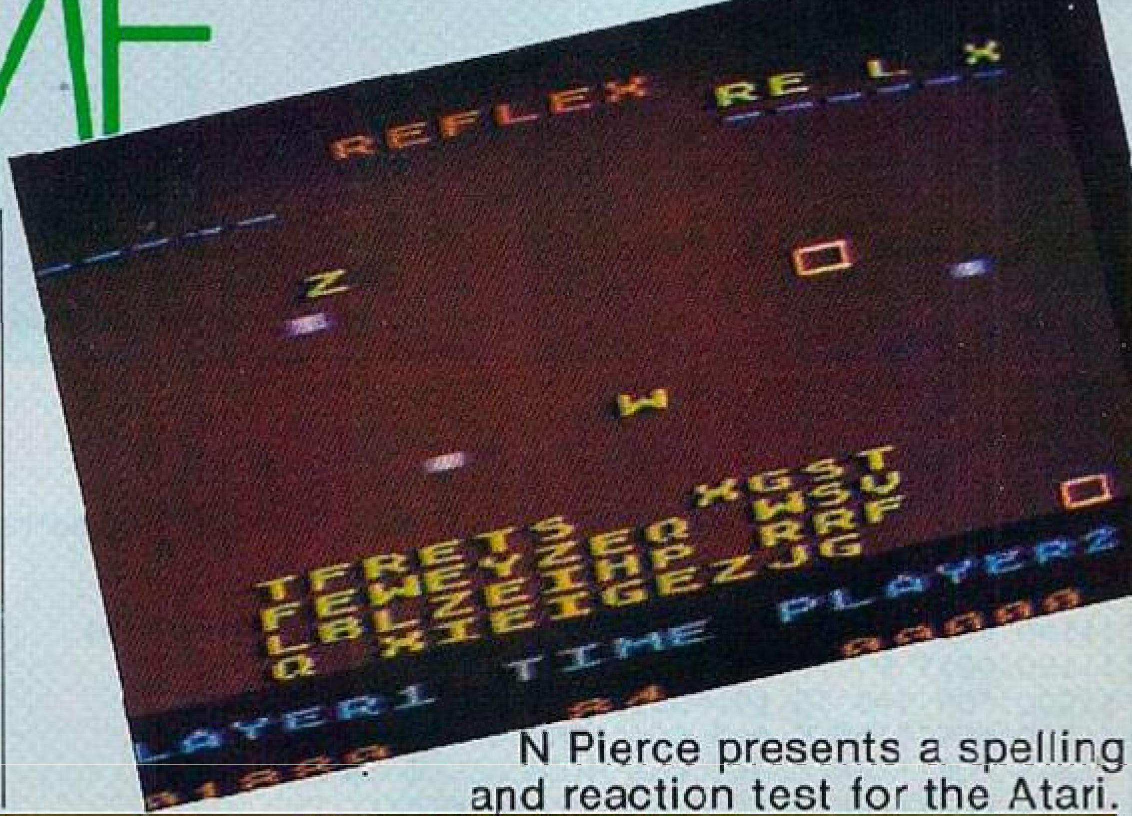
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**Making the most of your micro.**

# THE WORD GAME




N Pierce presents a spelling and reaction test for the Atari.

WORD GAME WILL run on a 16K Atari computer.

In the listing supplied:

- underlined words should be in inverse video,
- the character £ should be a #,
- Rem statements need not be typed.

The program uses a relocatable machine-code routine which is executed during part of the vertical blank interrupt procedure.

It uses memory locations 203 to 209 in page 0 and 1536 to 1586 in page 6 to hold control variables.

Briefly, its function is to: control player-missile images, cause the two cursors to flash, read and act upon input from joysticks 1 and 2, generate a periodic buzz on sound channel 3, and detect player-missile collisions.

(continued on next page)

```
20 GOTO 8000:REM WORD GAME -N.Pearce, Mar 84
499 REM *** loop ***
500 FOR P=0 TO 1
510 IF PEEK(PHIT+P) THEN GOSUB 2000
520 IF PEEK(PCRASH+P) THEN 600
530 IF  NOT STRIG(P) THEN GOSUB 1000:SOUND P,0,0,0
540 NEXT P
570 TIME=255-PEEK(1??):SPEED=5-INT(TIME/20):POKE 48,SPEED
580 GOSUB SHOWPTS:IF  NOT TIME THEN GOSUB 1600:GOTO 11000
585 IF PEEK(CONSOL)=START THEN 12000
590 GOTO 500
600 SOUND P,PEEK(PY+P),10,10:IF PEEK(PY+P)>182 THEN POKE PC+P,216:POKE PCRASH+P,
0:SOUND P,0,0,0
610 GOTO 540
999 REM *** drop/pick-up letter ***
1000 SOUND P,40+20*P,10,10
1020 IF PEEK(CARRY+P) THEN 1200
1100 IF PEEK(PY+P)<48 THEN RETURN
1105 FX=INT((PEEK(PX+P)-46)/8):FY=INT((PEEK(PY+P)-25)/8)
1110 LOCATE FX,FY,U:IF U<97 OR U>122 THEN RETURN
1120 POSITION FX,FY:PUT £6,0
1130 POKE CARRY+P,1:POKE PC+P+2,(U-95)*8
1190 RETURN
1200 FX=INT((PEEK(PX+P)-46)/8):FY=INT((PEEK(PY+P)-25)/8)
1210 LOCATE FX,FY,U:POSITION FX,FY
1230 IF U THEN RETURN
1240 PUT £6,INT(PEEK(PC+P+2)/8)+96:POKE CARRY+P,0:POKE PC+P+2,0
1250 IF PEEK(PY+P)<48 THEN PTS(P)=PTS(P)+375+SPEED*55:L(P)=L(P)-1:IF  NOT L(P) T
HEN POP :POP :GOTO 1600
1290 RETURN
1499 REM *** word completed ***
1600 SOUND 0,40+20*P,10,10:SOUND 1,0,0,0:WINNER=2
1602 FOR P=0 TO 1:POKE PCRASH+P,1:POKE PD+P,0:NEXT P
1605 FOR P=0 TO 1:L(P)=0
1610 FOR I=0 TO 5:J=ASC(V$(I+1))+32:LOCATE I+P*14,1,U
1630 IF J=U THEN PTS(P)=PTS(P)+325+SPEED*70:L(P)=L(P)+1:GOTO 1640
1635 IF U THEN PTS(P)=PTS(P)-175:IF PTS(P)<0 THEN PTS(P)=0
1640 GOSUB SHOWPTS
1650 NEXT I
1660 IF L(P)=6 THEN EXTRA=1000+SPEED*500:WINNER=P
1680 NEXT P
1682 IF WINNER=2 THEN SOUND 0,243,10,10:GOTO 1686
1683 POSITION WINNER*14,12:? £6;EXTRA:POSITION WINNER*14,13:? £6;"BONUS":POSITIO
N WINNER*14,14:? £6;"POINTS"
1684 SOUND 0,20,10,10:PTS(WINNER)=PTS(WINNER)+EXTRA:GOSUB SHOWPTS
1686 FOR I=0 TO 300:NEXT I:FOR P=0 TO 1:SOUND P,0,0,0:NEXT P
1690 IF  NOT TIME THEN RETURN
1700 GOTO 12500
1999 REM *** missile hit ***
2000 POKE PCRASH+P,1:POKE PC+P,232:POKE PD+P,0
2002 POKE PSIZ+P,1:SOUND P,31,0,12
2005 FOR I=0 TO 90:NEXT I
2010 PTS(P)=PTS(P)-100-TIME:IF PTS(P)<0 THEN PTS(P)=0
2020 POKE PSIZ+P,0:POKE PD+P,13:POKE PC+P,224
2040 POKE PHIT+P,0
2050 IF PEEK(CARRY+P) THEN 1200
2090 RETURN
4999 REM *** showPTS ***
5000 N$=STR$(PTS(0)):OUT$="00000":OUT$(6-LEN(N$))=N$:POSITION 1,23:? £6;OUT$
5100 N$=STR$(PTS(1)):OUT$="00000":OUT$(6-LEN(N$))=N$:POSITION 14,23:? £6;OUT$
5200 N$=STR$(TIME):OUT$="00":OUT$(3-LEN(N$))=N$:POSITION 9,23:? £6;OUT$
5250 RETURN
7999 REM *** initialize ***
8000 GRAPHICS 0:SETCOLOR 4,3,2:SETCOLOR 2,3,2:CONSOL=53279:START=6
8100 ? "              WORD GAME":?
8110 ? "The object of the game is to fill"
8120 ? "your 6 blank spaces with letters"
8130 ? "to form the word displayed at the"
8140 ? "top of the screen.":?
8150 ? "You must choose letters from the"
8160 ? "group at the bottom of the screen"
8170 ? "and carry them on your flashing"
8180 ? "cursor. This is controlled with a"
8190 ? "joystick and letters are picked-up"
8200 ? "and dropped by pressing the trigger.":?
8210 ? "You lose points if your cursor is"
8220 ? "hit by a missile or if you use the"
8230 ? "the wrong letters.":?
8240 ? "The game lasts for 99 time units"
8250 ? "and is best if 2 players play, using"
8260 ? "joysticks 1 and 2.":?
8300 ? "            Press START";
8310 IF PEEK(CONSOL)<>START THEN 8310
9000 RAMTOP=106:MYTOP=PEEK(RAMTOP)-16:POKE RAMTOP,MYTOP:MT=MYTOP*256
9020 GRAPHICS 17:DLIST=PEEK(560)+256*PEEK(561)
9100 CHIGH=206:MLOW=207:MHIGH=208
9110 MB=1580:PHIT=1581:CARRY=1583:PD=1576:PCRASH=1578:TICK=1586
9120 PCOL=704:PSIZ=53256:SIZEM=53260:SHOWPTS=5000
9130 MYES=1536:MNO=1540:MX=1548:MY=1552:PP=1556:PC=1564:PX=1568:PY=1572
9150 PMBASE=54279:SDMCTL=559:GRACTL=53277:PRIOR=623:CHBAS=756:NMIEN=54286
9180 DIM A$(1),B$(20),B1$(20),N$(9),OUT$(7),V$(6),W$(360),X$(40),PTS(1),L(1)
9190 B$="":REM B$=20 CHR$(0) chars
9195 B1$="        ":REM B1$=6xCHR$(0) 8 spaces 6xCHR$(0)
9270 SETCOLOR 4,3,2:SETCOLOR 2,8,8:SETCOLOR 3,5,10
9280 POSITION 5,4:? £6;"word game"
9282 POSITION 5,15:? £6;"copyright"
9284 POSITION 2,18:? £6;"nick peirce 1984"
9286 POSITION 8,23:? £6;"WAIT"
9299 REM charset
9300 FOR I=0 TO 471:POKE MT+I,PEEK(57344+I):NEXT I
9310 FOR I=472 TO 495:READ J:POKE MT+I,J:NEXT I:POKE CHBAS,MYTOP
9399 REM pmg
9400 POKE PMBASE,MYTOP+2:POKE SDMCTL,62:POKE GRACTL,3:POKE PRIOR,49
9410 POKE CHIGH,MYTOP+1:POKE MLOW,0:POKE MHIGH,MYTOP+5
9430 FOR I=MT+1380 TO MT+2669:POKE I,0:NEXT I
9440 FOR I=0 TO 3
9450 READ J,K:POKE MYES+I,J:POKE MNO+I,K
9460 POKE MX+I,INT(RND(0)*256):POKE MX+I,0:POKE PP+I,MYTOP+6+I
9480 NEXT I
9490 POKE PCOL+2,204:POKE PCOL+3,204:POKE MB,0
9494 POKE MY,60:POKE MY+1,110:POKE MY+2,85:POKE MY+3,135:POKE SIZEM,85
9499 REM dli & vbi
9500 FOR I=1600 TO 1620:READ J:POKE I,J:NEXT I
9510 POKE DLIST+24,PEEK(DLIST+24)+128:POKE 512,64:POKE 513,6
9520 FOR I=MT+512 TO MT+854:READ J:POKE I,J:NEXT I
9530 POKE 1613,MYTOP-2:K=USR(1611):REM enable vbi
9540 POKE NMIEN,192
9599 REM chars
9600 DATA 255,129,129,129,129,129,129,255
9610 DATA 112,138,133,65,66,130,241,14
9620 DATA 145,86,126,124,63,60,95,135
9699 REM missiles,dli,vbi
9700 DATA 3,252,12,243,48,207,192,63
9710 DATA 72,169,40,141,10,212,141,25,208,104,64
9720 DATA 104,162,0,160,0,169,7,76,92,228
9799 REM vbi routine
9800 DATA 216,165,20,208,8,173,50,6,141,5,210,208,9,201,6,208,5,169
9810 DATA 0,141,5,210,206,49,6,208,37,169,12,141,49,6,173,192,2,201
9820 DATA 24,208,11,   ,24,   ,105,4,141,192,2,24,144,5,169,24,141,192
9830 DATA 2,173,192,2,24,105,32,141,193,2,162,1,189,42,6,208,6,189
9840 DATA 120,2,157,40,6,188,40,6,152,41,8,208,10,169,200,221,32,6
9850 DATA 240,3,254,32,6,152,41,4,208,10,169,48,221,32,6,240,3,222
9860 DATA 32,6,152,4  ,2,208,10,169,134,221,36,6,240,3,254,36,6,152
9870 DATA 41,1,208,16,169,39,221,36,6,240,3,222,36,6,189,47,6,240
9880 DATA 16,138,168,200,200,189,32,6,153,32,6,189,36,6,153,36,6,202
9890 DATA 16,158,162,3,56,189,12,6,237,44,6,157,12,6,202,224,1,208
9900 DATA 241,24,189,12,6,109,44,6,157,12,6,202,16,243,162,3,189,8
9910 DATA 208,168,41,1,240,8,141,45,6,169,0,157,12,6,152,41,2,240
9920 DATA 8,141,46,6,169,0,157,12,6,202,16,224,141,30,208,162,3,169
9930 DATA 20,6,133,204,189,24,6,133,203,169,0,160,255,200,145,203,192,7
9940 DATA 208,249,189,36,6,157,24,6,133,203,189,28,6,133,205,177,205,145
9950 DATA 203,136,16,249,189,32,6,157,0,208,138,72,72,189,4,6,133,229
9960 DATA 108,0,6,162,5,168,207,47,237,148,207,200,202,16,216,104,170,109
9970 DATA 16,6,157,8,6,168,189,0,6,133,209,162,3,165,209,17,207,145
9980 DATA 207,206,202,16,246,104,170,189,12,6,157,4,208,202,16,149,76,98,228
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(listing continued on next page)

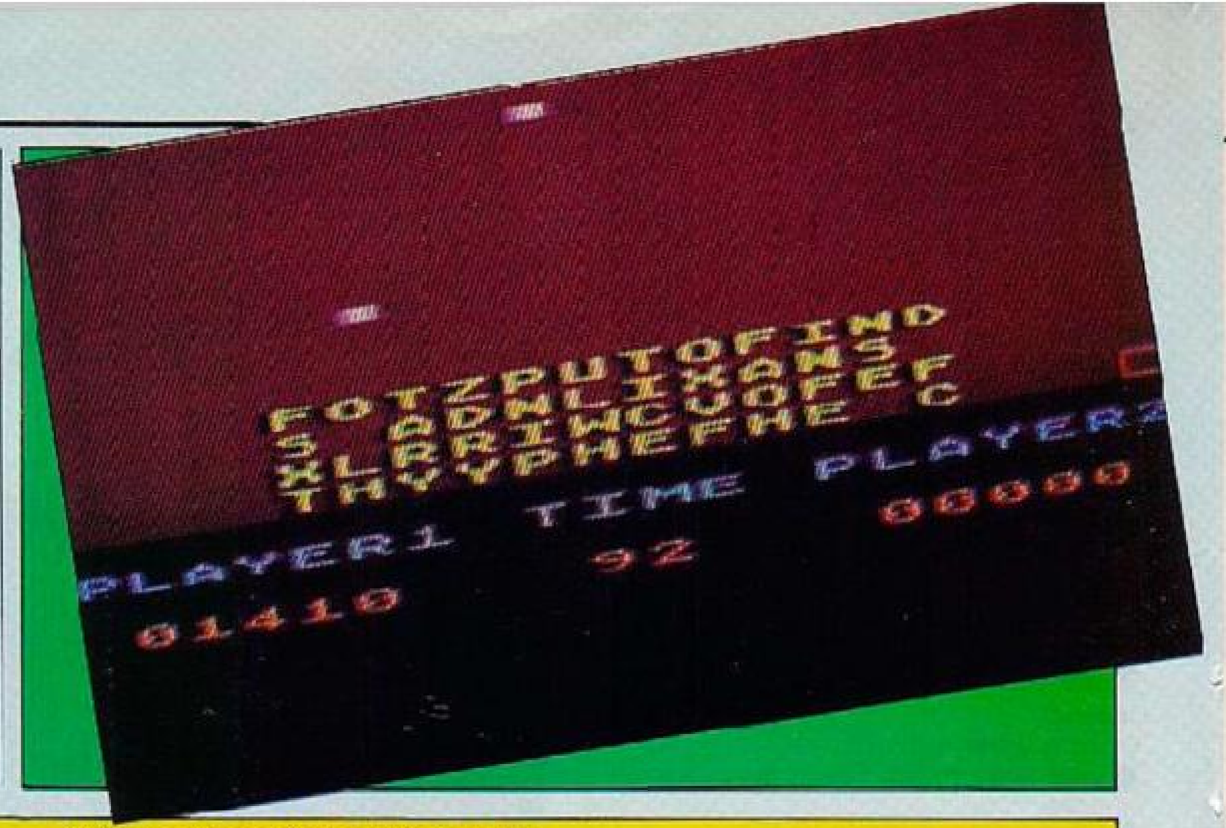
*(continued from previous page)*

The two flashing cursors are moved by using joysticks 1 and 2. To pick up a letter, position your cursor over the letter and press the trigger to drop the letter, press the trigger again. You can restart the game at any time by pressing the Start key.

The object of the game is to fill your six blank spaces with letters to form the word displayed at the top of the screen.

You must choose letters from the group at the bottom of the screen and carry them to the blank spaces; avoiding the missiles on the way. Points are lost if a missile hits your cursor or if you use the wrong letters. The first player to complete the word correctly gets bonus points.

The game lasts for 99 time units and the missiles gradually move faster as the game progresses. ■




*(listing continued from previous page)*

```
10499 REM *** begin ***
10500 FOR I=0 TO 23:POSITION 0,I:? £6;B$;:NEXT I
10520 POSITION 0,2:? £6;"------              ------"
10540 POSITION 0,21:? £6;"PLAYER1 TIME PLAYER2"
10550 FOR P=0 TO 1:PTS(P)=0:NEXT P:TIME=0:GOSUB SHOWPTS
10999 REM *** game over ***
11000 POKE MS,0:POKE TICK,0
11100 FOR P=0 TO 1:IF PTS(P)>=HIGH THEN HIGH=PTS(P)
11120 NEXT P
11200 FOR I=3 TO 19:POSITION 0,I:? £6;B$;:NEXT I
11300 POSITION 5,6:? £6;"WORD GAME"
11305 POSITION 1,9:? £6;"HIGH SCORE IS ";HIGH
11310 POSITION 4,11:? £6;"press START"
11320 POSITION 4,12:? £6;"for new game"
11330 POSITION 4,14:? £6;"press RESET"
11340 POSITION 5,15:? £6;"to finish"
11400 IF PEEK(CONSOL)<>START THEN 11400
11999 REM *** new game ***
12000 W$="":POKE 77,0:FOR P=0 TO 1:SOUND P,0,0,0:NEXT P
12065 W$(LEN(W$)+1)="PEOPLECOUNTYISLANDANTHEMACTIVEKNIGHTTENNISZOMBIECLOSEDCHOOS
E"
12070 W$(LEN(W$)+1)="RECORDREPLAYFLIGHTGROUPSSTEADYLETTERBETTERSQUAREREFLEXCASTL
E"
12075 W$(LEN(W$)+1)="FILLERELAPSEWANTEDPOTATOONIONSSECONDSCREAMBUTTONNATIONSWITC
H"
12080 W$(LEN(W$)+1)="AUGUSTDOUBLEGROUNDHUMBLEJUMBLEKETTLEMIRROROCCULTQUEUESTHOUG
H"
12085 W$(LEN(W$)+1)="UNDONEWINDOWVISIONOCCUPYBOUNCEPERIODFREEZEFRIDGEHOCKEYCAMER
A"
12090 W$(LEN(W$)+1)="QUARRYBANKERCOLOURMANUALSYSTEMDRAGONMODERNTIGERSPLANETESCAP
E"
12100 FOR P=0 TO 1:PTS(P)=0:NEXT P:SOUND 2,2,6,4:POKE TICK,68:TIME=99:GOSUB SHOW
PTS:POKE 20,255:POKE 19,156
12499 REM *** next ***
12500 FOR P=0 TO 1:POKE CARRY+P,0:POKE PHIT+P,0:POKE PCRASH+P,1:POKE PX+P+2,0:L(
P)=6:POKE PC+P,216:NEXT P
12600 POSITION 0,0:? £6;B$;:POSITION 0,1:? £6;B1$;
12620 FOR I=3 TO 19:POSITION 0,I:? £6;B$;:NEXT I
12640 POKE PX,48:POKE PY,184:POKE PX+1,200:POKE PY+1,184
12999 REM *** new word ***
13000 W=INT(RND(0)*60)*6+1:IF W$(W,W)="@" THEN 13000
13020 V$=W$(W,W+5):W$(W,W)="@"
13040 X$="":FOR I=1 TO 48:X$(LEN(X$)+1)=CHR$(INT(RND(0)*26)+97):NEXT I
13080 FOR K=1 TO 2:FOR I=1 TO 6:J=INT(RND(0)*48)+1:X$(J,J)=CHR$(ASC(V$(I))+32):N
EXT I:NEXT K
13100 J=15:FOR I=1 TO 37 STEP 12:J=J+1:POSITION 4,J:? £6;X$(I,I+11):NEXT I
13150 POSITION 7,0:? £6;V$
13160 FOR P=0 TO 1:POKE PCRASH+P,0:NEXT P
14000 GOTO 500
```

# ADD-ONS FOR SPECTRUM, ZX81 AND VIC

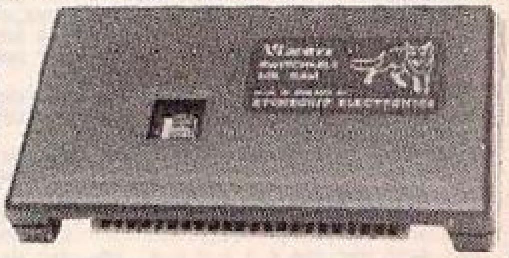


The famous Panda Expandable RAM pack for the ZX81. Massive 16K add-on memory which can easily be expanded to a GIANT 32K with an optional plug-in MODULE. Rugged no-wobble design injection moulded case with integral LED power on indicator. No additional power supply needed, just plug on and go. British designed and built. Thousands in use. Prices: PANDA 16K £19.95. MODULE £14.50. GIANT 32K £34.00.

## THE VIXEN SWITCHABLE RAM £34.95

16K RAM CARTRIDGE

The Vixen 16K switchable Ram cartridge is unique approach to expanding your VIC 20. Being switchable from either 16K to 8K + 3K programs already in use based on the unexpanded Vic 20 are not obsoleted. Supplied in attractive custom made case it simply plugs into the rear of the computer or motherboard. No additional power needed. High quality gold plated contacts ensure long trouble free life. Switches are recessed to avoid accidental operation. Designed and built in Britain. Guaranteed one year.



## Spectravideo QUICK SHOT 2. JOYSTICK

The Most Popular Joystick, 8 position, 2 fire buttons PLUS Rapid-Fire switch. Left or Right handed index finger (Trigger Finger) and top-mounted Thumb operated Fire Button. Comfortable contoured ultra ergonomic Design. Built-in Stabilizing suction caps for impressive one-handed operation. Suitable for most computers with Nine way socket. VIC 20, Commodore 64, Atari, Spectrum (with interface) etc. £10.00 inc.

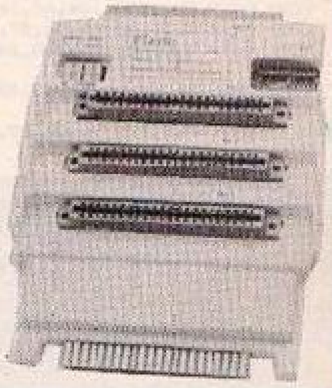
### Programmable Joystick Interface. For the Spectrum

Use any game suitable for the Spectrum and simply program the Joystick to take control of the cursor and FIRE functions. Useable with any Joystick having the standard nine pin plug. Fits snuggly onto the user port of the Spectrum. Can handle 8 directions and even complex functions such as diagonal with fire etc. No additional software needed, simply plug in, program and play. **£24.95 inc.**



## THE VIXEN MOTHERBOARD £31.95

THE EXPANDABLE EXPANSION SYSTEM. Providing 4 additional cartridge slots PLUS ROM socket. The slots are switchable enabling cartridges to be left in place and selected as needed by switching thus avoiding constant handling and the danger of breakage. Having one socket at the rear enables further expansion. Used in conjunction with one or more Vixen Rams full expansion can be achieved. ROM socket enables ROMs and Eproms to be fitted for future software programs, toolkits etc.
A range of ROM based software will soon be available from the manufacturers. Industry standard Eproms, 2716,2732 etc are readily available and easily programmed and copied.
A sound investment for the serious user and serious games player which will not become obsolete





LIGHT PEN. For the VIC 20. This allows the user to draw and paint in colour on the screen. It is ideal for screen layouts, graphic designs or as a games aid. Screen layouts can be altered and erased as desired and the finished work can be saved on tape and reloaded for future use or editing. Excellent Horizontal and Vertical resolution with superb stability. The Pen works perfectly in the High Resolution Graphics mode, even though the resolution determined by your VIC 20 is only 1/4 Pixel. Supplied complete with software cassette and full instructions. **£19.95**

## PROFESSIONAL CASED KEYBOARD TYPE FD42. Models for the ZX81 and SPECTRUM

(PLEASE STATE WHICH)

The Fuller FD42 has long been our most popular seller. Its sturdy, attractive but very tough injection moulded ABS case houses the computer and converts it into a professional unit with 42 full size long-life computer-style full-travel keys. Keys are indelibly etched with ZX81 or Spectrum legends. No stills or soldering needed and full access is maintained to the user ports etc for add-ons. Power supply can be fitted inside. Has integral LED for power ON/OFF indication. In all a thoroughly worthwhile accessory to your computer. £29.95 plus £2.00 postage and handling.



## SPECTRUM UPGRADES 16K to 48K

THE KIT — Fit it yourself, a beautifully packed and presented kit with complete (Really complete in the detail you need if you've never seen inside your computer) instructions. No soldering — no wire bending — no fiddly bits. Thousands in use. Everything you need to upgrade your issue 2 Spectrum from 16K to a full blown 48K.
The really economical upgrade — in stock for swift despatch. **£24.00**

THE PACK — A sturdily packages 16K to 48K upgrade pack that simply plugs on to the user port and works immediately. Throughport so any other accessories may be fitted as before. No need to open the case, no unscrewing, no soldering, no need to invalidate your guarantee. Designed and built in Britain. Guaranteed. Supplied in handsome carton suitable for gift wrapping. **£39.95**

NEW!! Upgrade your ISSUE 3 Spectrum from 16K-48K. This kit is supplied with full parts and very comprehensive instructions as to how to upgrade your ISSUE 3. Due to the change in design of the issue 3 this has not been possible with previously available kits. Not for the complete amateur as it requires two simple soldered connections to be made, anyone who has soldered before or who has a friend can fit this quite easily though. **£26.50**

# NEW! CASSETTE INTERFACE FOR THE VIC 20 AND COMMODORE 64

Interface your Vic with any cassette player. Don't be tied to one you have to buy. If your model has external motor control capability, this interface will also control the motor/start. Simple to use, supplied with leads and inexpensive. £14.95 inc.

**PRODUCTS ARE STOCKED AND USUALLY DESPATCHED WITHIN 10 DAYS.**

I wish to order the following: *(Please state which computer)*

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All prices include VAT and post and packaging. All items include a full year guarantee. Products are stocked and usually despatched within 10 days. Overseas customers add £4 post and packing. Cheques/Postal Order, etc., payable to TREMIVER LTD.

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93A PACK LANE, BASINGSTOKE, HANTS.
Tel. (0256) 66116

64, 127, 64, 127, 64, 127, 0,0

### Listing 1

```
   1 REM ************************
   2 REM * JACK U.D.G.'s        *
   3 REM *                      *
   4 REM * Colin Carruthers     *
   5 REM * and Ronald Sellar    *
   6 REM ************************
   7 REM
  10 CLEAR 59999
  15 LET total=0
  20 FOR a=60000 TO 60511
  30 READ v: POKE a,v
  35 LET total=total+v
  40 NEXT a
  50 IF total<>32538 THEN PRINT
"**ERROR - CHECK DATA !"
  60 STOP
1000 DATA 0,0,0,0,126,60,60,60
1010 DATA 0,0,0,0,0,0,0,2
1020 DATA 127,127,0,0,0,0,0,0
1030 DATA 254,254,0,0,0,0,0,0
1040 DATA 0,30,30,60,56,24,0,0
1050 DATA 0,0,120,124,60,12,12,0
1060 DATA 0,30,30,60,56,57,1,0
1070 DATA 0,0,40,112,240,240,224
,0
1080 DATA 56,62,53,53,53,53,53,5
3
1070 DATA 0,0,128,96,80,80,80,11
2
1100 DATA 53,53,53,53,54,60,56,5
6
1110 DATA 96,192,128,0,0,0,0,0
1120 DATA 0,5,7,3,1,0,3,15
1130 DATA 0,32,224,192,128,0,128
,224
1140 DATA 15,31,31,31,31,63,31,0
1150 DATA 240,248,248,252,254,25
4,252,0
1160 DATA 0,0,0,0,0,0,0,7
1170 DATA 0,0,56,110,120,96,96,2
24
1180 DATA 31,63,63,99,3,3,7,0
1190 DATA 224,224,192,0,0,0,128,
0
1200 DATA 0,7,8,17,34,36,37,37
1210 DATA 0,240,8,196,36,20,20,2
44
1220 DATA 36,34,33,32,32,32,28,0
1230 DATA 4,8,240,0,0,0,0,0
1240 DATA 0,0,0,0,0,0,0,0
1250 DATA 0,0,0,0,0,62,34,34
1260 DATA 0,57,70,66,66,127,127,
0
1270 DATA 56,130,14,18,18,254,62
,0
1280 DATA 0,0,0,7,15,31,63,127
1290 DATA 0,0,0,254,252,250,244,
234
,0
1310 DATA 20,234,20,232,16,224,0
,0
1320 DATA 0,32,32,48,120,120,124
,62
1330 DATA 16,84,254,254,254,254,
254,108
1340 DATA 63,31,15,7,3,0,0,0
1350 DATA 0,128,224,248,252,254,
60,0
1360 DATA 0,1,1,1,1,1,1,3
1370 DATA 0,128,128,128,128,128,
128,192
1380 DATA 3,7,7,7,7,7,7,0
1390 DATA 192,224,224,224,224,22
4,224,0
1400 DATA 0,7,12,12,7,3,3,3
1410 DATA 0,128,192,192,128,0,0,
0
1420 DATA 3,3,3,3,3,3,3,3
1430 DATA 0,0,0,0,112,224,112,0
1440 DATA 0,126,66,74,74,126,126
,126
1450 DATA 0,0,0,0,0,0,0,10
1460 DATA 126,126,126,126,126,0,
0,0
1470 DATA 18,34,66,130,2,0,0,0
1480 DATA 0,0,1,3,7,15,5,0
1490 DATA 0,0,0,128,0,128,192,22
4
1510 DATA 240,188,4,4,8,0,0,0
1520 DATA 1,7,5,29,21,21,21,20
1530 DATA 192,64,112,80,80,80,80
,17
1540 DATA 16,16,16,16,8,8,9,15
1550 DATA 61,65,130,132,72,48,16
,240
1560 DATA 0,0,15,7,3,3,3,3
1570 DATA 0,124,252,246,222,254,
190,234
1580 DATA 1,1,1,1,1,3,7,0
1590 DATA 126,254,190,246,254,25
2,192,0
1600 DATA 7,7,1,1,1,1,1,1
1610 DATA 224,224,128,128,128,12
8,128,128
1620 DATA 1,1,7,7,7,7,3,1
1630 DATA 128,128,224,224,224,22
4,192,128
9990 REM tape
9991 SAVE "Jack.udg"CODE 60000,5
12
9992 VERIFY ""CODE
9993 STOP
9995 REM Microdrive
9996 SAVE *"m";1;"Jack.udg"CODE
60000,512
9997 VERIFY *"m";1;"Jack.udg"COD
E
```

IN THIS adventure game based on *Jack and the Beanstalk* you play the role of our intrepid hero Jack; your aim is to recover the three treasures held by the evil Giant who lives in a strange land up in the clouds.

The program uses a mixture of text and graphics to represent the locations and objects you find on your travels. Owners of the Currah MicroSpeech unit will be able to hear the Giant's thundering voice.

Each location is represented by its own subroutines where all the associated variables are set. These include a location description string, a Help message, and pointers to surrounding locations.

Commands are also handled by individual subroutines. These routines check various flags and later those affected by the command. Table 2 gives a complete list of available command verbs.

Objects are split into two groups — these which can be picked up and carried and these which can only be examined. Portable objects (continued on page 102)

### Listing 2.

```
   1 REM ************************
   2 REM * JACK and the         *
   3 REM * BEANSTALK            *
   4 REM *                      *
   5 REM * by Colin Carruthers  *
   6 REM * and Ronald Sellar    *
   7 REM ************************
   8 REM
   9 REM
  10 LET a$="": LET i=0: LET set
=1000: LET pre=0: LET keys=0
  15 POKE 23609,10: BORDER 0: PA
PER 0: INK 7: GO SUB 8000
  20 LET l(25)=1: LET h$="You're
 doing fine, Jack.": LET no=0: L
ET we=no: LET ea=no: LET so=no:
LET up=no: LET do=no
  30 GO SUB set
  35 IF l(20)=1 THEN LET e(4)=se
t
  40 CLS : PRINT 'l$
  42 IF NOT l(3) THEN LET s$="ff
(ee)  ff(ii)  ff(eau)  ffum
(ii)smel(th)(ee)bluud of an ingl
i(sh)man": PRINT ''A thundering
voice just behind  you says...."
''"  Fee Fi Fo Fum," "  I smell
the blood"'"  of an Englishman."
  45 IF e(4)=set THEN IF set<>12
50 THEN PRINT "Daisybell the cow
 is here."
  50 IF l(20)=2 THEN LET l(20)=0
: PRINT "A strange man wearing a
 white  hat and a butcher's apr
on says 'Aha !'  Just what I ne
ed.'  He takes 'Daisybell' and b
efore youcan do anything he disa
ppears,  leaving some beans on t
he path."
  55 IF NOT l(25) THEN PRINT "It
's too dark to see anything.": G
O TO 100
  57 IF l(25)=2 THEN LET l(25)=0
  60 LET found=0: FOR n=1 TO max
: IF l(n)<>set THEN NEXT n: GO T
O 90
  63 IF NOT found THEN PRINT : P
RINT "You can see..": PRINT : LE
T found=1
  65 GO SUB 700
  70 NEXT n
  80 GO TO 100
  90 IF (a$="look" OR a$="l") AN
D NOT found THEN PRINT "You can'
t see anything special"
 100 BEEP .01,10: GO SUB 600: IF
 i$="" THEN GO TO 100
 102 FOR n=1 TO LEN i$: IF i$(n)
>="A" AND i$(n)<="Z" THEN LET i$
(n)=CHR$ (CODE i$(n)+32)
 103 NEXT n
 105 GO SUB 500
 107 IF pre=set THEN GO TO 6600
 109 IF NOT l(3) THEN LET pre=se
t
 110 IF a$="go" THEN LET a$=b$:
LET b$=""
 115 IF (a$="n" OR a$="north") A
ND no THEN LET set=no: GO TO 20
 120 IF (a$="s" OR a$="south") A
ND so THEN LET set=so: GO TO 20
 130 IF (a$="w" OR a$="west") AN
D we THEN LET set=we: GO TO 20
 140 IF (a$="e" OR a$="east") AN
D ea THEN LET set=ea: GO TO 20
 150 IF (a$="d" OR a$="down" OR
a$="descend") AND do THEN LET se
t=do: GO TO 20
 155 IF (a$="u" OR a$="up" OR a$
="climb") AND up THEN LET set=up
: GO TO 20
 160 IF a$="recap" OR a$="r" THE
N GO TO 40
 170 IF a$="help" OR a$="h" THEN
 PRINT h$: GO TO 100
 180 IF a$="take" OR a$="get" TH
EN GO TO 3000
 190 IF a$="put" OR a$="drop" TH
EN GO TO 4500
 210 IF a$="look" OR a$="l" THEN
 GO TO 55
 220 IF a$="examine" OR a$="ex"
OR a$="read" THEN GO TO 3400
 230 IF a$="save" THEN GO TO 560
0
 240 IF a$="load" THEN GO TO 530
0
 250 IF a$="inventory" OR a$="i"
 THEN GO SUB 3600: GO TO 100
 260 IF a$="sleep" THEN GO TO 64
00
 270 IF a$="tie" THEN GO TO 4400
 280 IF a$="wear" THEN GO TO 400
0
 290 IF a$="quit" THEN GO TO 900
0
 300 IF a$="remove" THEN GO TO 4
000
 310 IF a$="oil" OR a$="lubricat
e" THEN GO TO 4200
 320 IF a$="unlock" THEN GO TO 3
200
 330 IF a$="open" THEN GO TO 380
0
 340 IF a$="dig" THEN GO TO 4300
 350 IF a$="eat" THEN GO TO 6000
 360 IF a$="light" OR a$="strike
" THEN GO TO 5400
 370 IF a$="smash" OR a$="break"
 THEN GO TO 5000
 380 IF a$="drink" THEN GO TO 52
00
 390 IF a$="chop" THEN GO TO 670
0
 490 IF LEN a$=1 THEN PRINT "You
 can't !": GO TO 100
 499 PRINT "You can't ";a$;" ";b
$;" !": GO TO 100
 500 IF i$(1)=" " AND LEN i$>1 T
HEN LET i$=i$(2 TO ): GO TO 500
 502 LET sp=0: LET a$="": LET b$
="": FOR n=1 TO LEN i$
 505 IF i$(n)=" " AND NOT sp THE
N LET sp=1: GO TO 520
 510 IF NOT sp THEN LET a$=a$+i$
(n)
 515 IF sp THEN LET b$=b$+i$(n)
 520 NEXT n
 530 RETURN
 600 POKE 23672,200: LET i$=""
 610 LET xat=25-PEEK 23689
 612 IF xat>21 THEN LET xat=21:
PRINT : PRINT
 615 PRINT INK 6;AT xat,0;"]";i$
;"_ ";
 620 PAUSE 0
 625 LET a$=INKEY$
 627 IF a$="" THEN GO TO 625
 628 BEEP .004,34.4
 630 IF CODE a$=13 THEN PRINT IN
K 6;AT xat,0;"]";i$;" ": RETURN
 635 IF CODE a$=12 AND i$<>"" TH
EN LET i$=i$( TO LEN i$-1): GO T
O 615
 645 IF (a$<"A" OR a$>"z") AND a
$<>" " THEN GO TO 620
 647 IF LEN i$>25 THEN BEEP .1,-
10: GO TO 620
 650 LET i$=i$+a$: GO TO 615
 700 LET addr=60000+(n-1)*32
 710 POKE 23675,addr-256*INT (ad
dr/256)
 720 POKE 23676,INT (addr/256)
 725 POKE 23692,255
 730 PRINT "  "; INK c(n,1);CHR$
 144; INK c(n,2);CHR$ 145
 740 PRINT "  "; INK c(n,3);CHR$
 146; INK c(n,4);CHR$ 147; INK 7
;"  ";o$(n)
 745 PRINT
 750 RETURN
1000 LET l$="You are inside a sm
all, barely  furnished room. To
the south is a door leading into
 the garden  and to the north is
 the front   door."
1003 IF l(26) AND l(2) THEN LET
l$=l$+"  Your Mother is asleep i
n the corner."
1005 IF NOT l(26) THEN LET l$=l$
+"  Your poor Mother says    'Ta
ke our cow to the market and sel
l her, Jack.'": LET l(26)=1
1007 IF l(26) AND NOT l(2) THEN
LET i=i-1: LET l$=l$+"  Your Mot
her is very,very angry. She says
 'You bad, stupidboy.  Now we sh
all starve.'  In her anger she t
hrows the beans  out of the wind
ow.": LET l(2)=9999: LET l(18)=1
1020 LET no=1050: LET so=1400
1030 RETURN
1050 LET l$="You are just outsid
e the          cottage.  A dusty p
ath leads to the east and a sign
 pointing    west says 'To The C
hurch.'"
1055 IF l(19) THEN LET h$="Going
 up ?": LET l$=l$+CHR$ 13+"There
 is a large green beanstalkrisin
g up into  the clouds !": IF l(7
)+l(14)=2 THEN LET up=1550
1060 LET we=2950: LET ea=1100: L
ET so=1000
1070 RETURN
1100 LET l$="You are on a dusty
road leading east to west with a
n opening to the north.  There i
s a pool  of oil on the ground."
1120 LET we=1050: LET ea=1150: L
ET no=2850
1130 RETURN
1150 LET l$="You are in some woo
ds.  The       dusty road continue
s east to      west, there is a cl
earing to thenorth and a small h
ill to the   south."
1155 IF l(20) AND RND>.75 THEN G
O SUB 5500
1170 LET no=2900: LET we=1100: L
ET so=1350: LET ea=1200
1180 RETURN
1200 LET l$="More woods.  The du
sty track nowruns north and sout
h.  Sounds   (and smells) of far
m animals    drift from the sout
h.  A sign tothe east says 'No F
ishing'."
1205 IF l(20) AND RND>.75 THEN G
O SUB 5500
1220 LET ea=3150: LET no=1150: L
ET so=1250
1230 RETURN
1250 LET l$="The market.  There
are lots and lots of farmers and
 farm animalsto be seen."
1255 IF l(20) THEN LET l$=l$+"
No-one seems to be interested in
 'Daisybell'."
1270 LET no=1200: LET so=1300
1280 RETURN
1300 LET l$="You are at the foot
 of a small  hill just outside t
he market.   A path to the west
climbs the   hill."
1305 IF l(20) AND RND>.75 THEN G
O SUB 5500
1320 LET up=1350: LET ea=1250: L
ET we=1350: LET no=1200
1330 RETURN
1350 LET l$="You are at the top
of the small hill.  To the east
you can see  the market and to t
he north is  your cottage."
1370 LET no=1150: LET ea=1300: L
ET we=1400: LET do=1300
1380 RETURN
1400 LET l$="You are in the back
 garden at   the foot of the hil
l.  The houseis to the north, yo
ur garden    shed is to the east
 and paths   lead south and west
."
1420 LET no=1000: LET up=1350: L
ET ea=2800: LET so=1450: LET we=
1500
1430 RETURN
1450 LET l$="Beside a waterfall.
  There is a pool of clear water
 to the west.To the north is a c
hurch and a  path leads east."
1470 LET we=3150: LET no=1500: L
ET ea=1400:
1480 RETURN
1500 LET l$="You are in an old c
hurchyard.   The church doors ar
e open to thenorth, there is a g
ate to the   south and a path to
 the east."
1520 LET no=2950: LET ea=1400: L
ET so=1450
1530 RETURN
1550 LET l$="Phew !  You are abo
ut one third of the way up the l
arge green   beanstalk.  Below y
ou can see   your house and the
surrounding  countryside.  What
a pity you   don't have a camera
 !"
1570 LET no=3100: LET so=no: LET
 ea=so: LET we=ea: LET up=1600:
```

# THE BEAN-STALK

Colin Carruthers and Ronald Sellar give climbing lessons.



```
LET do=1050
1580 RETURN
1600 LET l$="You are now about t
wo thirds of the way up.  The vi
ew is realy  spectacular. That n
ew fisheye   lens would be great
 for this."
1620 LET no=3100: LET so=no: LET
 we=so: LET ea=we: LET up=1650:
LET do=1550
1630 RETURN
1650 LET l$="You are now at the
top of the   beanstalk, in a wil
d, bare      country.  Not a tre
e or blade   of grass can be see
n.  A long   road leads north."
1670 LET no=1700: IF l(7)+l(14)=
 2 THEN LET do=1600
1680 RETURN
1700 LET l$="The long road winds
 its way     across the barren w
asteland."
1705 IF NOT l(21) THEN LET l(21)
=1: LET l$=l$+"     There is an o
ld lady here. She  says, 'Good m
orning, Jack.  You are now in a
country belonging  to a wicked G
IANT .  His taste  in food could
 be your downfall.'"
1720 LET no=1800: LET we=1550: L
ET ea=1750
1730 RETURN
1750 LET l$="You are still on th
e road.      There is not much c
hange to the countryside so I wo
n't bother   describing it again
, except to  say that there is a
 castle away to the north."
1770 LET no=1800: LET we=1700
1780 RETURN
1800 LET l$="You are lost in a m
aze with     paths leading every
where."
1810 LET h$="1  5.45  10  77"
1812 IF a$="r" AND (l(22)=0 OR l
(22)=2) THEN LET l(22)=2: GO TO
1820
1814 IF a$="e" AND l(22)=2 THEN
LET l(22)=3: GO TO 1820
1816 IF a$="w" AND l(22)=3 THEN
LET l(22)=4: GO TO 1820
1818 IF a$="s" AND l(22)=4 THEN
LET l(22)=0: LET set=1850: GO TO
 set
1819 LET l(22)=0
1820 LET no=1800: LET so=no: LET
 ea=no: LET we=no
1830 RETURN
1850 LET l$="You have arrived at
 the castle  door.  A path leads
 round the   castle to the east.
"
1870 LET we=1750: LET ea=1900
1880 RETURN
1900 LET l$="You are now faced w
ith the east wall of the castle.
  There are  no obvious entrance
s.  The path continues north."
1920 LET no=1950: LET so=1850: L
ET we=1850
1930 RETURN
1950 LET l$="The back of the cas
tle looks    much the same as th
e east wall.  There does not seem
 to be a      tradesman's entranc
e.  The path continues westwards
 and there isanother going north
."
1970 LET no=2600: LET we=1850: L
ET ea=1900
1980 RETURN
2000 LET l$="You are in the entr
ance hall.   There are four door
s leading    north, south, east
and west."
2020 LET so=1850: LET ea=2050: L
ET we=2500: LET no=2350
2030 RETURN
2050 LET l$="The Library.  This
is a large   and very impressive
 room which  is full of books.
There is a   red 'phone on a sma
ll table in  the corner."
2070 LET we=2000
2080 RETURN
2100 LET l$="The Kitchen.  This
is a fairly  large room again.
Indeed the   furniture could be
said to be   GIANT !  There is a
 cupboard to the east and stairs
 lead down."
2115 IF l(24) THEN LET ea=2200
2120 LET no=2250: LET do=2150
2130 RETURN
2150 LET l$="There is a distinct
 smell of    Bordeaux white circ
a 1967."
2170 LET l(25)=0: LET up=2100
2180 RETURN
2200 LET l$="The Cupboard.  Ther
e are shelvesall round the walls
 but you are too small to reach
them.  There is only one exit."
2220 LET we=2100
2230 RETURN
2250 LET l$="The Dining Room.  T
he table in  here is of epic pro
portions.    Doors lead west and
 south and tothe east is a sign.
"
2270 LET we=2300: LET so=2100: L
ET ea=1950
2280 RETURN
2300 LET l$="The Lounge.  Large
easy chairs  are the main featur
e of this    huge room.  Doors l
ead west,    south and east."
2305 IF l(3) THEN LET l$=l$+" Th
ere is a GIANTsleeping in one of
 the chairs.  Ssssh !"
2320 LET we=2550: LET ea=2250: L
ET so=2350
2330 RETURN
2350 LET l$="The Music Room.  Th
ere is a     large portrait of B
eethoven on  the wall and the la
st movement  of his ninth sympho
ny is coming from the immense Hi
-Fi in the   corner.  Doors lead
 north, west and south."
2370 LET we=2450: LET so=2000: L
ET no=2300
2380 RETURN
2400 LET l$="The Secret Passage.
"
2420 LET l(25)=0: LET up=2500
2430 RETURN
2450 LET l$="The Store Room.  Th
ere is a     large safe in the c
orner.  Thereseems to be a passa
ge leading   downwards as well a
s the door tothe east."
2470 LET do=2400: LET ea=2350
2480 RETURN
2500 LET l$="The Billiard Room.
 Several cuesare strewn about th
e floor.  A  large red ball the
size of a     football is lying u
p against thebiggest snooker tab
le you have  ever seen.  There's
 a scoreboardon the wall.  The d
oor leads    east."
2520 LET ea=2000
2530 RETURN
2550 LET l$="The Television Room
.  The 45""   t.v. set is on.  T
he programme  is 'Blue Peter' an
d Simon Groomehas forgotten the
script as     usual.  He appears
 to be showinghow to make your o
wn secret     passage out of yog
urt cartons   and sticky-back pl
astic."
2570 LET ea=2300
2580 RETURN
2600 LET l$="You are on the firs
t tee of a   huge golf course. A
 sign stuck  in the ground says
'Hole 1,     7345 yds, Par 3'. S
ome way off  to the north you ca
n see a flag.The castle is to th
e south."
2620 LET no=2650: LET so=1950
2630 RETURN
2650 LET l$="You are now half wa
y down the    fairway. The flag b
lows gently  in the breeze, but
is still someway off."
2670 LET no=2700: LET so=2600
2680 RETURN
2700 LET l$="You are now on the
green. The    flag towers above y
ou, and the  hole is at least 6
feet across. There is a bunker t
o the east,  and a stream to the
 north."
2720 LET ea=2750: LET so=2650: L
ET no=3150
2730 RETURN
2750 LET l$="You are now in the
bunker. This would be a tricky s
hot if you    were really playing
 golf."
2770 LET we=2700: LET so=2650
2780 RETURN
2800 LET l$="You are in the gard
en shed. The garden is to the we
st and a      dusty track climbs
the hill to  the south."
2820 LET we=1400: LET so=1350
2830 RETURN
2850 LET l$="You are standing in
 a quarry.    There are huge slab
s of stone    all around."
2870 LET so=1100: LET ea=2900: L
ET up=ea
2880 RETURN
2900 LET l$="You are on a cliff
top.  Down    below you can see t
he quarry andto the south some t
rees."
2920 LET do=2850: LET so=1150
2930 RETURN
2950 LET l$="Inside the church.
 Someone is  playing music on th
e organ.  Youare facing the main
 door to the south with a small
side door to your left."
2970 LET so=1300: LET ea=1050
2980 RETURN
3000 IF b$="" THEN PRINT a$;" wh
at ??": GO TO 100
3002 IF l(25)=0 THEN PRINT "It's
 too dark to ";a$;" anything.":
GO TO 100
3003 IF i>=5 THEN PRINT "You can
't carry any more !": GO TO 100
3005 LET found=0: FOR n=1 TO max
: IF m$(n)=(b$+"           ")( T
O 7) AND l(n)=set THEN LET found
=n: GO SUB 3040
3006 NEXT n
3007 IF found THEN GO TO 100
3010 FOR n=1 TO max: IF o$(n)=(b
$+"              ")( TO 14) AND l
(n)=set THEN LET found=n: GO SUB
 3040
3012 NEXT n
3020 IF NOT found THEN PRINT "Th
at's not possible !": GO TO 100
3030 GO TO 100
3040 IF found>=3 AND found<=5 TH
EN IF NOT l(3)+l(4)+l(5) THEN PR
INT "You can only carry one trea
sure at a time.": RETURN
3045 IF found=3 THEN PRINT "The
harp cries 'Master! Master!'You
hear sounds of movement nextdoor."
3050 PRINT "OK..": LET l(found)=
0: LET i=i+1: RETURN
3100 PRINT "There is a loud scre
am as you    fall to your death,
narrowly     missing your house."
: FOR n=60 TO 0 STEP -2: BEEP .0
1,n: NEXT n: GO TO 9000
3150 PRINT "Gurgle..gurgle..gurg
le......     You have fallen in t
he water anddrowned.": FOR n=60
TO 0 STEP -2: BEEP .01,n: NEXT n
: GO TO 9000
3200 IF b$="" THEN PRINT "Unlock
 what ??": GO TO 100
3203 IF b$="safe" THEN GO TO 335
0
3205 IF b$<>"door" AND b$<>"cast
le door" THEN PRINT "It doesn t
have a keyhole !": GO TO 100
3210 IF set<>1850 THEN PRINT "Th
ere is no door to unlock.": GO T
O 100
3215 IF l(23) THEN PRINT "It's a
lready unlocked, silly !": GO TO
 100
3220 IF l(11) THEN PRINT "You do
 not have the key.": GO TO 100
3225 IF l(14)=-1 THEN PRINT "You
 can't quite manage to get   the
 key into the lock.": GO TO 100
3230 IF NOT l(17) THEN PRINT "Th
e key is jamming the lock.": GO
TO 100
```

*(listing continued on next page)*

continued from previous page

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3240 PRINT "Clunk !": LET l(23)=1: GO TO 100
3300 BEEP .01,10: INPUT "Combination please: "; LINE a$: IF a$="" OR LEN a$>10 THEN GO TO 3303
3305 PAUSE 50: FOR n=1 TO LEN a$: PRINT a$(n);: IF a$(n)<"0" OR a$(n)>"9" THEN PRINT AT 20,7;"That's not a number !": GO TO 3390
3307 FOR m=1 TO VAL a$(n): BEEP .01,0: PAUSE 10: NEXT m: PAUSE 50: NEXT n
3310 IF a$="3725" THEN PRINT AT 20,7;"Click.": PAUSE 100: LET l(27)=1: GO TO 3390
3315 IF a$="4234" OR a$="7345" THEN PRINT AT 20,7; PAPER 2;"Boom !!": FOR n=60 TO 0 STEP -5: BEEP .01,n: BORDER n/10: INPUT " ": PRINT PAPER n/10;p$: NEXT n: INPUT " ": FOR n=1 TO 150: NEXT n: CLS : PRINT "The safe blows up in your face. This has unfortunately caused   you to meet your maker.": GO TO 9000
3320 PRINT " IS WRONG !!!": GO TO 3390
3350 IF set<>2450 THEN PRINT "There is no safe here.": GO TO 100
3352 CLS : BORDER 1: DRAW 255,0: DRAW 0,175: DRAW -255,0: DRAW 0,-175: INPUT " "
3355 PLOT 55,47: DRAW 65,0: DRAW 0,81: DRAW -65,0: DRAW 0,-81: PLOT 120,47: DRAW 8,8: DRAW 0,81: DRAW -65,0: DRAW -8,-8: PLOT 120,128: DRAW 8,8
3360 LET p$=CHR$ 21+CHR$ 1: FOR n=6 TO 15: LET p$=p$+CHR$ 22+CHR$ n+CHR$ 7+"          ": NEXT n
3365 PRINT AT 11,9; INK 0;CHR$ 140;CHR$ 140: CIRCLE INK 0;96,104,4: CIRCLE INK 0;96,104,7
3370 PRINT PAPER 0; INK 7;p$
3375 PRINT AT 18,7;
3380 GO TO 3300
3390 PAUSE 100: BORDER 0: CLS : INPUT " ": GO TO 20
3400 IF b$="" THEN PRINT "Examine what ??": GO TO 100
3405 IF l(25)=0 THEN PRINT "There's not enough light.": GO TO 100
3410 LET found=0: FOR n=1 TO max: IF m$(n)=(b$+"          ")( TO 7) AND (l(n)=set OR l(n)=0) THEN LET found=1: PRINT "You see.."'d$(n)
3415 NEXT n: IF found THEN GO TO 100
3420 FOR n=1 TO 10: IF e$(n)=(b$+"          ")( TO 10) AND e(n)=set THEN LET found=1: PRINT "You see.."'d$(n+16)
3425 NEXT n: IF found THEN GO TO 100
3430 FOR n=1 TO max: IF o$(n)=(b$+"              ")( TO 14) AND (l(n)=set OR l(n)=0) THEN LET found=1: PRINT "You see.."'c$(n)
3435 NEXT n: IF found THEN GO TO 100
3440 PRINT "You see nothing interesting.": GO TO 100
3600 LET found=0: FOR n=1 TO max: IF l(n)<>0 THEN NEXT n: GO TO 3640
3610 IF NOT found THEN PRINT "You have the following..": PRINT : LET found=1
3620 GO SUB 700
3630 NEXT n
3640 IF NOT found THEN PRINT "You don't have anything !"
3650 RETURN
3800 IF b$="" THEN PRINT "Open what ??": GO TO 100
3802 IF b$="safe" OR b$="safe door" THEN GO TO 3900
3805 IF b$<>"door" AND b$<>"castle door" THEN PRINT "That would be a great feat !": GO TO 100
3810 IF set<>1850 THEN PRINT "There is no door to open.": GO TO 100
3820 IF NOT l(23) THEN PRINT "It's locked !!": GO TO 100
3830 PRINT "Creak ! The door swings open.": LET no=2000: GO TO 100
3900 IF set<>2450 THEN PRINT "There ain't no safe here, man !": GO TO 100
3910 IF NOT l(27) THEN PRINT "It won't open.": GO TO 100
3920 IF l(27)=2 THEN PRINT "It's already open.": GO TO 100
3930 LET l(27)=2: LET l(15)=2450: PRINT "You open the safe door.": GO TO 100
4000 IF b$="" THEN PRINT a$;" what ??": GO TO 100
4010 LET found=0: IF b$="gloves" THEN LET found=14
4020 IF b$="boots" THEN LET found=7
4030 IF NOT found THEN PRINT "Don't be silly !": GO TO 100
4040 IF l(found)=0 THEN LET i=i-1: LET l(found)=-1: PRINT "OK..": GO TO 4070
4050 IF l(found)=set THEN LET l(found)=-1: PRINT "OK..": GO TO 4070
4060 PRINT "I see no ";b$;" !": GO TO 100
4070 IF set=1050 AND l(7)+l(14)=-2 THEN LET up=1550: GO TO 100
4080 IF set=1550 AND l(7)+l(14)=-2 THEN LET do=1600: GO TO 100
4090 GO TO 100
4100 IF b$="" THEN PRINT a$;" what ??": GO TO 100
4110 LET found=0: IF b$="gloves" THEN LET found=14
4120 IF b$="boots" THEN LET found=7
4130 IF NOT found THEN PRINT "Are you nuts ?": GO TO 100
4140 IF set=1600 OR set=1550 THEN GO TO 3100
4150 IF l(found)=-1 THEN LET l(found)=set: PRINT "OK.."
4160 IF NOT found THEN GO TO 499
4170 IF up=1550 THEN LET up=0
4180 IF do=1600 THEN LET do=0
4190 GO TO 100
4200 IF b$="" THEN PRINT "Oil what ??": GO TO 100
4210 IF b$<>"key" AND b$<>"rusty key" THEN PRINT "Why ?": GO TO 100
4215 IF l(11) THEN PRINT "You do not have the key !": GO TO 100
4220 IF set<>1100 THEN PRINT "I can see no lubricants.": GO TO 100
4230 PRINT "OK..": LET l(17)=1: LET o$(11)="shiny key": LET d$(11)="  a nice, gleaming mortice key."
4235 FOR n=1 TO 4: LET c(11,n)=5: NEXT n
4240 GO TO 100
4300 IF b$<>"" AND b$<>"sand" AND b$<>"in sand" THEN PRINT "You must be joking !": GO TO 100
4310 IF l(16) THEN PRINT "You have no digging implement.": GO TO 100
4320 IF set<>2750 THEN PRINT "There is nothing to dig.": GO TO 100
4325 IF l(9)<>9999 THEN PRINT "You are too hungry to dig !": GO TO 100
4330 PRINT "Scrape..scrape.. A hole appears in the sand.": LET l(14)=set: GO TO 100
4400 IF b$="" THEN PRINT "Tie what ??": GO TO 100
4410 IF b$<>"rope to cow" THEN PRINT "This is not possible !": GO TO 100
4420 IF set<>1030 THEN PRINT "What cow ?": GO TO 100
4435 IF l(6) THEN PRINT "You have no rope !"
4440 LET l(20)=1: PRINT "Moo !! The cow is now tied by  the neck.": GO TO 100
4500 IF b$="" THEN PRINT a$;" what ??": GO TO 100
4505 LET found=0: FOR n=1 TO max: IF m$(n)=(b$+"          ")( TO 7) AND l(n)=0 THEN PRINT "OK..": LET found=1: LET l(n)=set: LET i=i-1
4506 NEXT n
4507 IF found THEN GO TO 100
4510 FOR n=1 TO max: IF o$(n)=(b$+"              ")( TO 14) AND l(n)=0 THEN PRINT "OK..": LET found=1: LET l(n)=set: LET i=i-1
4515 NEXT n
4520 IF NOT found THEN PRINT "You don't have ";b$;" !"
4530 GO TO 100
5000 IF b$="" THEN PRINT a$;" what ??": GO TO 100
5010 IF b$<>"door" AND b$<>"cupboard door" THEN PRINT "I don't think that would be a   good idea !": GO TO 100
5020 IF set=1850 OR set=1300 OR set=1050 OR set=1400 THEN PRINT "The door is too strong.": GO TO 100
5030 IF set<>2100 THEN PRINT "You see no door here.": GO TO 100
5040 IF l(13) THEN PRINT "You've nothing to smash it with!": GO TO 100
5045 IF NOT l(23) THEN PRINT "You'll need some refreshment !": GO TO 100
5050 LET l(24)=1: LET ea=2200
5055 PRINT "Crunch !!  The remains of the  cupboard door fall away to the  side."
5060 GO TO 100
5400 IF b$="" THEN PRINT a$;" what ?": GO TO 100
5410 IF b$<>"match" THEN PRINT "Be reasonable !": GO TO 100
5420 IF l(12) THEN PRINT "What match ??": GO TO 100
5430 IF l(25)=1 THEN PRINT "That was a waste !": GO TO 100
5440 LET l(25)=2: PRINT "That's better !": GO TO 100
5500 LET l(20)=2: LET e(4)=9999: LET l(2)=set: RETURN
5600 LET l(33)=e(4): LET l(34)=set: LET l(35)=i
5610 SAVE "Jack" DATA l()
5630 GO TO 100
5800 PRINT "Please wait..": GO SUB 7000
5805 PRINT "Start tape.."
5810 LOAD "Jack" DATA l(): LET e(4)=l(33): LET set=l(34): LET i=l(35)
5820 IF l(17) THEN FOR n=1 TO 4: LET c(11,n)=5: NEXT n: LET o$(11)="shiny key": LET d$(11)="  a
```

(continued from page 100)

have a graphic representation which appears after Look and Inventory commands. Associated with each of these objects are three levels of description, for example: "bag", "money bag" and "a cloth bag full of gold coins". The first two forms are those that can be used in commands like Get Bag or Get Money Bag. The third is the response given by the program to the Examine command.

Some special commands are also implemented. These include: Save, Load, Inventory, Recap and Quit.

First type in listing 1. This creates 64 user-defined graphic characters which are used in the graphic representation of the portable objects. When this runs without an error message, save the resulting code either to tape by typing

GO TO 9990

or to Microdrive cartridge by typing

GO TO 9995

Now type in the main program, listing 2. What you do now depends on whether you are using a Microdrive or tape. With a Microdrive simply type

GO TO 9995

having inserted the cartridge with the UDG code already on it. With tape it is now necessary to re-load the UDG code saved by listing 1. Do this by typing

GO TO 9990

This will load the code and then Save/Verify both the Basic program and the code automatically.

If this task seems rather onerous then tape and Microdrive copies are available at £4.95 and £8.95 respectively from: Colin Carruthers, 22 Drylaw House Gardens, Edinburgh EH4 2UE. In addition, maps can be obtained from the same address at only £1.

*Table 1. Variables.*

| | |
|---|---|
| l(n) | Array of flags and object locations. |
| m$(n) | Short descriptions of objects. |
| o$(n) | Standard descriptions of objects. |
| d$(n) | Verbose descriptions of objects. |
| e$(n) | Fixed objects that can be examined. |
| e(n) | Location of fixed objects. |
| set | Current location. |
| l$ | Current location description. |
| h$ | Current help message |
| up,do,no, so,ea,we | Pointers to surrounding locations. |
| i | No. of objects carried. |
| i$,a$,b$ | Input line, command and parameter. |
| max | Maximum number of portable objects. |
| found,sp | Assorted flags. |
| n,m | General for/next control variables. |
| keys s$ | Currah MicroSpeech variables. |

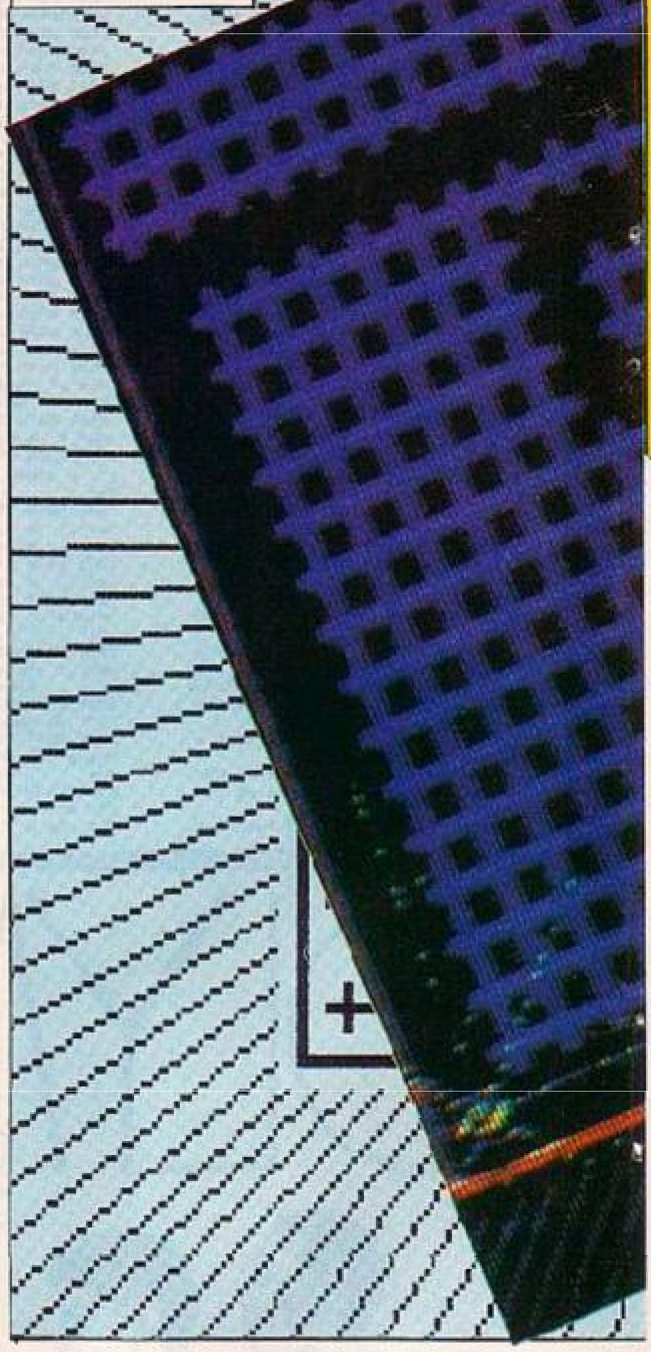
*Table 2. Program breakdown*

| | |
|---|---|
| 10 | Initialisation |
| 20 | Main Loop |
| 500 | Command Decoder |
| 600 | Input routine |
| 700 | Prints graphical representation of object n |
| 1000 | Location subroutines |
| 3000 | Get/Take |
| 3200 | Unlock |
| 3400 | Examine |
| 3600 | Inventory |
| 3800 | Open |
| 4000 | Wear |
| 4100 | Remove |
| 4200 | Oil/Lubricate |
| 4300 | Dig |
| 4400 | Tie |
| 4500 | Drop |
| 5000 | Break/Smash |
| 5400 | Light/Strike |
| 5600 | Save |
| 5800 | Load |
| 6000 | Eat |
| 6200 | Drink |
| 6400 | Sleep |
| 6600 | Caught by Giant |
| 6700 | Chop |
| 7000 | Main Initialisation |
| 8000 | Titles |
| 9000 | Game Over |
| 9990 | Tape/Microdrive Program save |

```
nice, gleaming mortice key."
5840 GO TO 20
6000 IF b$="" THEN PRINT "Eat wh
at ?": GO TO 100
6010 IF b$<>"food" THEN PRINT "T
hat would not be very nice !": G
O TO 100
6020 IF l(9)<>set AND l(9)<>0 TH
EN PRINT "There is no food.": GO
 TO 100
6030 PRINT "There are sounds of
munching as you eat the food.":
IF l(9)=0 THEN LET i=i 1
6035 LET l(9)=9999
6040 GO TO 100
6200 IF b$="" THEN PRINT a$;" wh
at ??": GO TO 100
6202 IF l(25)=0 THEN PRINT "You
can see nothing to ";a$: GO TO 1
00
6205 IF b$="water" THEN GO TO 63
00
6210 IF b$<>"wine" AND b$<>"bott
le of wine" THEN PRINT "That's i
mpossible !!": GO TO 100
6220 IF l(10)<>set AND l(10)<>0
THEN PRINT "There is no wine.":
GO TO 100
6230 LET l(28)=1: PRINT "You dri
nk some wine.": GO TO 100
6300 IF set<>1450 AND set<>2700
THEN PRINT "This is a very dry a
rea. In factit is so dry there i
s no water  to drink.": GO TO 10
0
6310 PRINT "Due to a lack of pol
lution      controls in this are
a, the waterwhich you have just
drank was   highly toxic. This h
as meant    that you are now an
Ex-Jack."
6320 FOR n=60 TO 1 STEP -1: BEEP
 .01,n: NEXT n: GO TO 9000
6400 IF l(18) THEN LET l(18)=0:
LET l(17)=1: CLS : PRINT AT 11,1
5;"ZZZzzzzz !!": GO SUB 8200: PA
USE 200: BORDER 0: GO TO 20
6410 CLS : PRINT AT 10,10;"ZZZZZ
zzzzz !!": FOR n=1 TO 400: NEXT
n
6420 GO TO 20
6600 FOR n=60 TO 0 STEP -1: BEEP
 .01,n: NEXT n
6610 PRINT "Due to your slow rea
ctions the  GIANT has caught you
 and bitten your head off.  This
 has caused your bodily function
s to cease.": GO TO 9060
6700 IF b$="" THEN PRINT "Chop w
hat ??": GO TO 100
6710 IF b$<>"beanstalk" THEN PRI
NT "That would be a waste of tim
e !": GO TO 100
6720 IF l(1) THEN PRINT "You do
not have the axe !": GO TO 100
6730 IF set<>1050 OR NOT l(19) T
HEN PRINT "What beanstalk ?": GO
 TO 100
6740 GO TO 9000
7000 RESTORE 7400
7005 LET max=16
7010 DIM l(35): DIM o$(max,14)
7020 DIM e$(10,10): DIM d$(26,46
)
7030 DIM m$(max,7): DIM s(10)
7035 DIM c(max,4)
7037 FOR n=1 TO max: FOR m=1 TO
4: READ c(n,m): NEXT m: NEXT n
7040 FOR n=1 TO max: READ l(n),o
$(n),m$(n),d$(n): NEXT n
7050 FOR n=1 TO 10: READ s(n),e$
(n),d$(n+16): NEXT n
7060 RETURN
7400 DATA 5,6,6,6
7405 DATA 6,3,4,4
7410 DATA 6,6,6,6
7415 DATA 4,4,4,4
7420 DATA 7,7,7,7
7425 DATA 6,6,6,6
7430 DATA 7,7,7,7
7435 DATA 5,5,5,5
7440 DATA 6,4,6,6
7445 DATA 4,4,4,4
7450 DATA 3,3,3,3
7455 DATA 5,6,5,6
7460 DATA 5,5,6,5
7465 DATA 6,6,6,6
7470 DATA 6,6,6,6
7475 DATA 6,6,5,5
7500 DATA 2000,"axe","axe","  an
 axe with a wooden handle"
7501 DATA 9999,"magic beans","be
ans","  some multi-coloured magi
c       beans"
7502 DATA 2350,"golden harp","ha
rp","  a magic golden harp"
7503 DATA 9999,"money bag","bag"
,"  a cloth bag full of gold coi
ns"
7504 DATA 2200,"magic goose","go
ose","  a magic goose that lays
        golden eggs"
7505 DATA 1300,"coil of rope","r
ope","  a coil of brown rope"
7506 DATA 1000,"climbing boots",
"boots","  a pair of Doc Martins
 !!"
7507 DATA 2050,"library book","b
ook","  an old book with parchme
nt      pages"
7508 DATA 2100,"some food","food
","  an apple and a banana"
7509 DATA 2150,"bottle of wine",
"wine","  une bouttelle de Borde
aux       Blanc 1967"
7510 DATA 2950,"rusty key","key"
,"  an old rusty key"
7511 DATA 2750,"box of matches",
"matches","  a box of Swan Vesta
s"
7512 DATA 2400,"sledge hammer","
hammer","  a rather fine Stanley
 sledge    hammer"
7513 DATA 1200,"leather gloves",
"gloves","  a pair of leather gl
oves"
7514 DATA 9999,"old parchment","
parchment","  that it says 'tric
ky shot'"
7515 DATA 2850,"spade","spade","
  a space with a metal handle"
7520 DATA 2450,"safe","  a safe
with a combination lock"
7521 DATA 2500,"scoreboard","  a
 scoreboard with score 37 25   o
n it"
7522 DATA 2050,"phone","  a GPO
'phone number 4234"
7523 DATA 1050,"cow","  a pretty
 black and white cow"
7524 DATA 1450,"waterfall","  a
waterfall with pretty          ra
inbow"
7525 DATA 1100,"oil","  a pool o
f Castrol GTX"
7526 DATA 1050,"beanstalk","  a
huge green plant climbing     hi
gh"
7527 DATA 1850,"door","  a HUGE
wooden door with          mortice
 lock"
7528 DATA 2550,"television","  a
 Decca 45"" goggle-box"
7529 DATA 2250,"sign","  a sign
saying  EMERGENCY EXIT'"
8000 CLS : RANDOMIZE : GO SUB 82
00: PRINT AT 5,15;"JACK";AT 7,15
;"and the";AT 9,15;"BEANSTALK";A
T 16,15; 1984  RAS+CC"
8015 GO SUB 7000
8020 PRINT ££0;"   Press any key
to continue": PAUSE 0
8030 CLS : DRAW 255,0: DRAW 0,17
5: DRAW -255,0: DRAW 0,-175
8040 PRINT OVER 1''"       JACK a
nd the BEANSTALK
                    "''" In this ad
venture you play the  part of Ja
ck.  Your aim  is to  steal the
three treasures from  the evil G
IANT.                 They are..
"
8050 PRINT OVER 1''"     1. The ma
gic goose."'"    2. The golden h
arp."'"    3. The bag of gold co
ins."''"          Good Luck !!"
8090 PRINT ££0;"     Press any ke
y to start": PAUSE 0: BORDER 0:
INPUT " "
8095 FOR n=0 TO -10 STEP -1: BEE
P 0.05,n: NEXT n
8100 RETURN
8200 BORDER 1: INPUT " "
8210 PRINT AT 20,0; PAPER 4;" "
8212 PLOT 0,0: DRAW 255,0: DRAW
0,175: DRAW -255,0: DRAW 0,-175
8215 LET x=70
8220 FOR n=16 TO 160 STEP 2
8225 LET rnd=RND
8230 LET x=x+(rnd>.5)-(rnd<.5)+(
x<=0)
8232 IF rnd>.95 THEN IF n>16 THE
N DRAW INK 4;20-n/16,3-RND*6
8233 IF RND>.95 THEN PLOT INK 4;
x,n: DRAW INK 4;-20+n/16,3-RND*6
8235 IF INKEY$=CHR$ 13 THEN BEEP
 .1,0: RETURN
8240 PLOT INK 4;x,n: DRAW INK 4;
(175-n)/10,0
8245 BEEP .0025,n/6
8250 NEXT n
8260 RETURN
9010 FOR n=3 TO 5: IF l(n)<1550
THEN LET score=score+1
9020 NEXT n
9025 IF score=0 THEN PRINT "You
have failed miserably. Due  to y
ou not being able to get onepiec
e of treasure back, your    moth
er is sure to starve.": GO TO 90
60
9030 IF score=1 THEN PRINT "You
have not done too well. Onlyone
of the treasures will not    last
 very long. Especially with infl
ation at 300%.": GO TO 9060
9040 IF score=2 THEN PRINT "Two
out of three ain't bad. Mum won'
t starve, but she won't be  all
that rich either.": GO TO 9060
9050 IF score=3 THEN PRINT "Cong
ratulations. You've managed to c
ollect all the treasures.   You
live happily ever after."
9060 BEEP 0.01,10: INPUT "Anothe
r game ? "; LINE a$
9065 IF a$="" THEN LET a$="y"
9070 IF a$(1)="y" OR a$(1)="Y" T
HEN GO TO 0
9080 STOP
9990 REM Tape
9991 CLEAR 59999: PRINT "Load":
LOAD ""CODE : SAVE "Jack" LINE 9
999
9992 SAVE "Jack.udg"CODE 60000,5
12
9993 PRINT "Verify": VERIFY "":
VERIFY ""CODE : STOP
9995 REM MICRODRIVE
9996 CLEAR : ERASE "m";1;"Jack":
 SAVE *"m";1;"Jack" LINE 9998
9997 VERIFY *"m";1;"Jack": STOP
9998 CLEAR 59999: LOAD *"m";1;"J
ack.udg"CODE : RUN
9999 CLEAR 59999: LOAD ""CODE :
RUN
```

# GRIDD WORZ

Simon Phipps and his BBC micro take on more than even three Shreaded Wheat can handle.



TIME ONCE MORE for your fingers to hit the keyboard as Simon Phipps, author of the recently released Jet Power Jack from Program Power, presents a space megaspectacular from his warped imagination. The game is a Basic and machine code original designed to tax both your brain — have you ever tried debugging assembler code? — and reflexes. Well, here we go . . .!

In the year 21867 man made a mistake. Not a very great one, not as big as deciding some several million years before to consider crawling out of the sea, but never the less it was for all intents and purposes a mistake. Some may have called it a great advance in the developments of psykinetics; the obscure branch of Vruggian metaphysics discovered by the equally obscure Earth scientist Professor Thruggon Botch, but still most called it a mistake.

The science of Psykinetic Transportation — or PT for short — was carefully studied by Professor Botch for many years and its true potential only realised after many experiments involving the passage of objects such as paper clips and biros into a strange dimension now named by most recognised physicists and loonies as the Meta Zone. The dimension exists in parallel with our own and is in fact responsible for many so called everyday occurrences.

Up until Professor Botch's discovery of the Meta Zone and the subsequent proof of its existence, anyone who had put forward ideas about parallel dimensionism was branded as suffering from severe paranoia or just generally laughed at.

The Professor's revelations at the discovery of the Meta Zone all related to a simple fact that everyone knows — when anything as small and important as that last paper clip is needed it always goes missing. He successfully broke the dimension barrier by carefully leaving a paper clip lying around and accurately monitored its position until it actually vanished.

By pure coincidence the moment that the paper clip ceased to exist as far as this Universe is concerned was exactly the same moment at which the Professor was looking for the aforementioned paper clip to hold his progress reports together.

Breaching the transdimensional barrier between our world and the Meta Zone in fact caused absolute havoc. Instead of simply enabling the return of all those missing biros and paper clips a gaping hole was produced in the dimension wall which began to suck up vast quantities of matter from our Universe.

It was quite a few minutes before some bright spark had an idea that would stop the chaos caused by the dimension warp. THREE Shredded Wheat were thrown in the general direction of the hole and immediately the havoc stopped. Of course even though the hole was well and truly plugged a few important things such as two-thirds of our Universe were at the other side of the Zone . . . whoops!

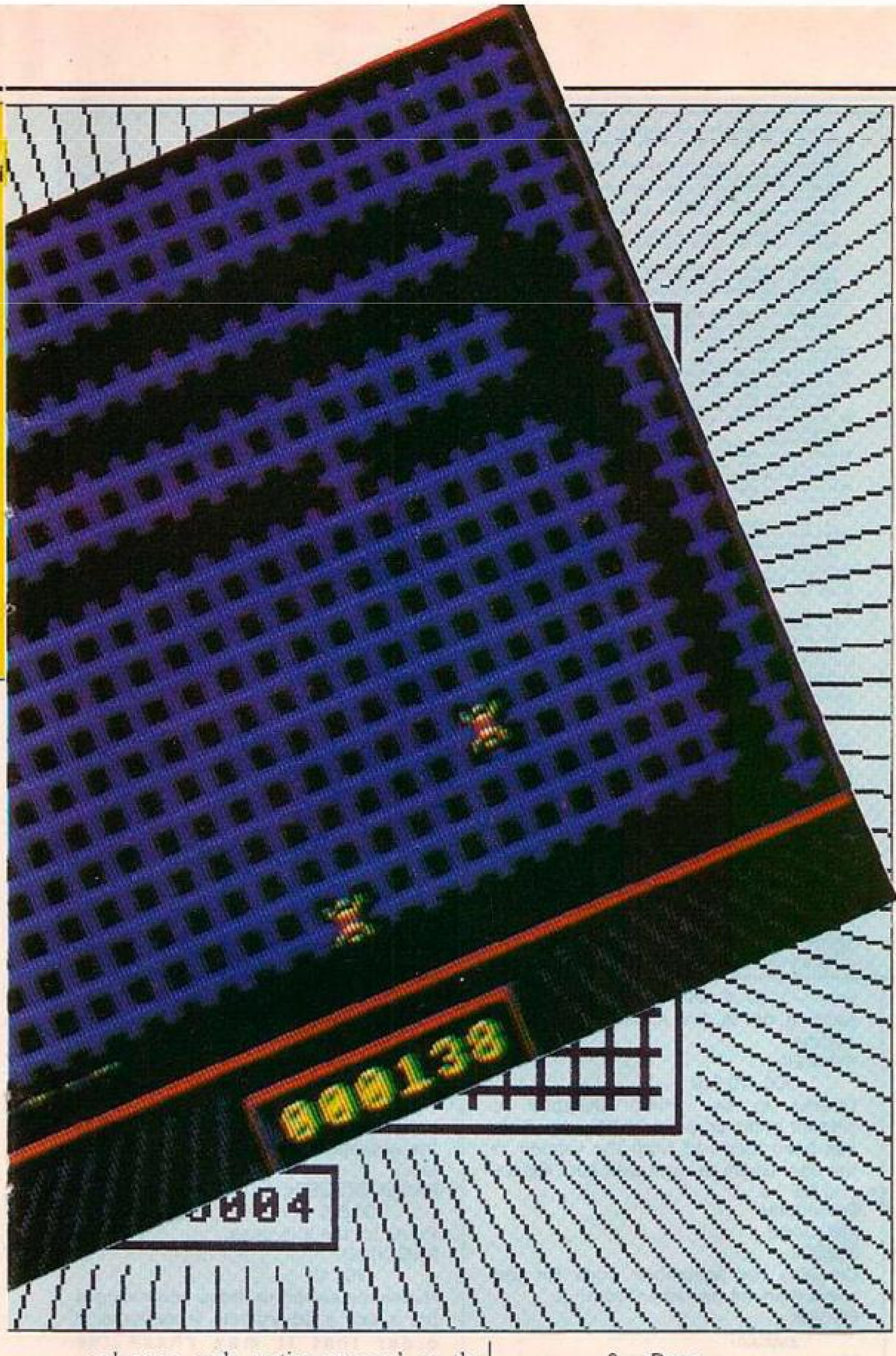
Inside the Meta Zone things were not at all hunky dory. What few people had managed to pull most of their molecules back together had decided to get out and so the amazingly trendily titled Zonetracker Squads were formed.

Finding a weakness in the dimension wall known as the Gridd, the squads attacked its structure in an effort to break out. Their task was, as with most video games, not easy — even with the aid of the powerful Zonetracker Gridd Ships, which by pure coincidence just happened to be lying around the place when they arrived.

Strange mutant Star Googjies known as Drones were found to inhabit the Gridd wall

*Listing 1.*

```
   10REM          GRIDD WORZ
   20REM              By
   30REM          Simon Phipps
   40*FX9,250
   50*FX10,250
   60MODE1:VDU19,2,4;0;19,3,6;0;:GCOL0,3:FORT=0TO100:P
LOT69,RND(1280),RND(1023):NEXT:GCOL0,2
   70FORT=0TO1280STEP64:MOVE1280,1023:DRAWT,0:MOVE0,0:
DRAWT,1023
   80MOVE1280,T:DRAWT,T*1024/1280:MOVE0,T:DRAWT,T*1024
/1280:NEXT
   90VDU29,640;512;
  100GCOL0,1:R=10:R1=10:T=0:REPEAT
  110MOVER*COST,R*SINT:FORT1=T TO 2*PI+T*2 STEP PI/2:D
RAWR*COST1,R*SINT1:NEXT
  120R=R+R1:R1=R1+1.2:T=T+PI/10:UNTILR>1000
  130VDU26:COLOUR3:PRINTTAB(10,30)"By Simon Phipps 198
4"
  140VDU5:FORT=1TO3:MOVE480+T*4,512+T*4:GCOL0,T:PRINT"
Gridd Worz":NEXT:VDU4
  150VDU19,3,14;0;19,1,9;0;
  160VDU17,129,28,9,27,30,18,12,17,131,28,10,26,29,19,
12,17,128,28,11,25,28,20,12,17,3
  170PRINT''"  Z .... Left"'"  X .... Right"'"  * ..
.. Up"'"  ? .... Down"
  180A=INKEY10000
  190ENVELOPE2,4,0,0,0,0,0,0,250,-10,-10,-1,126,60:ENV
ELOPE1,1,12,-5,15,1,1,60,127,0,127,127,-127,-127:VDU23
,224,129,66,36,24,24,36,66,129,23,225,24,60,126,255,25
5,126,60,24,23,232,36,60,36,102,126,255,255,165
  200VDU23,234,165,255,255,126,102,36,60,36,23,233,224
,112,255,114,114,255,112,224,23,231,7,14,255,78,78,255
,14,7,23,240,24,24,24,255,255,24,24,24,23,241,0,0,0,25
5,255,0,0,0,23,242,24,24,24,24,24,24,24,24,23,243,24,2
4,24,248,248,0,0,0
  210VDU23,244,24,24,24,31,31,0,0,0,23,245,0,0,0,31,31
,24,24,24,23,246,0,0,0,248,248,24,24,24,23,255,255,255
,255,255,255,255,255,255
  220CLS:CHAIN"GWORZ"
```




and more such nasties appeared as the Zonetracker Squads disrupted sections of the Gridd and hence progressed to the higher energy Gridd levels. The Drones were highly advanced Meta beings whole sole purpose apart from being a general annoyance to everyone was to repair and eliminate any impurities on the Gridd which meant both short circuits and the Zonetrackers themselves.

The idea of the game is to pilot your Zonetracker across the Gridd wall destroying the individual Gridd sections. After approximately 75 percent of the Gridd has been destroyed the network explodes allowing passage to the next Gridd level.

Can you save the humans at the other side of the Zone from a fate worse than missing the next issue . . .? Start typing now!

Control keys for the Zonetracker are:

Z — Left
X — Right
? — Down
* — Up

Type in listing 1 and save it on cassette and then enter listing 2 and saving that under the title of "GWORZ".

*The variable and procedure listing for listing 2 — Gridd WorZ.*

**Integers**

A%
30,250,330,520
General dogs-body variable, used in Inkey statements and FNPeek (x%,y%).

AX%
290,300,350,710
Value of the memory address at which the x co-ordinate values of the drones' positions are stored from.

AY%
290,300,350,710
Value of the memory address at which the y co-ordinate values of the drones' positions are stored from.

B%
330
Seems to have slipped into the program by mistake — spot the untidy programmer.

CO%
160,170,200,290,300,470,480
Number of Gridd sections left to be destroyed by the Zonetracker before the Gridd destructs.

CODE%
360,530
Value of the memory address from which the machine code is assembled into.

D%
710,750,780
Dogs-body variable used in PROCRNDCHAR(C%) and PROCRND.

E%
710
Simply used in PROCRND to select the value of the x co-ordinate increments on the chosen drone's x co-ordinate value.

H%
120,130,330
The value of the character representing the drones. This is constantly being altered to give the pulsing effect of the drones.

HI%
10,240,250
Value of the high score.

J%
1000,1010
Variable used to generate the explosion of the Zone tracker.

K%
420,430,1000,1010
Variable used in the same way as J% to generate the explosion and also as the new value of the y-increment on the Zonetracker's co-ordinates depending upon the keys pressed in PROCSnake.

K1%
40,170,210,480
Variable used to check if the Zonetracker has collided with anything.

L%
420,440
Variable used to determine the x-increment of the Zonetracker's x co-ordinate depending upon the keys pressed in PROCSnake.

LI%
40,210
The number of lives left.

M%
830,840
Used in FNBIN (a$) to determine the value returned by the functions.

P%
530
Program counter — where the machine code is being assembled into.

R%
830
For-To-Next loop variable in FNBIN (a$) which checks down the string passed to the procedure character by character.

S%
710,760
Dogs' body variable used in PROC RND and PROCRNDChar (c%).

SC%
750,780
String used in PROCRND Char (c%) to store the string returned by FNBIN (a$).

HI$
10,30,250,910,920,960,970,980
Name of the current highest scores.

a$
700,830,840
General dogs'-body string variable used in PROCedures and functions.

*(continued on next page)*

## Listing 2.

[illegible]

*(continued from previous page)*

**Reals**

A

890

Used as the length of the side of the box in PROCBox (x%, y%).

ALIEN

100

Value of the address at which the drone initialisation subroutine is assembled from.

B

890

Used as length of side of box in PROCBox (x%, y%).

C

520

Used in FNPeek (x%, y%) to store the value of the character at position x%, y%.

P

370

Variable used to read from the Data statement in line 380.

T

1000,1010

Dogs'-body For-To-Next loop variable used in explos on routine.

YUK

150

Value of the address at which the drone movement subroutine is assembled from.

**Functions**

FNBIN

780,830

Converts the binary string stored in a$ to a decimal value stored in that string.

FNMIN

710,720

Function converting the values of +1 and −1 to 1 and 2 respectively for passing on to the machine-code subroutine.

FNPEEK

300,470,520

Checks to see which character is present at the co-ordinate X%, Y%. This has been modified from the version in the User Guide to work with both OS 0.1 and OS 1.2.

**Procedures**

PROCASS

360,530

Contains the assembler code for the drone element movement routine.

PROCE

290,320

Places a shortcircuit at the co-ordinates dictated by X% and Y%.

PROCBOX

880,890

Draws a box of side T% as defined on being called. Note the y-axis side length is multiplied by 0.8 to produce a true square as seen by the viewer.

PROCCHARS

80,260

Calls up PROCRNDChar (c%) to define the drone characters — CHR$229 and CHR$230.

PROCDED

210,1000

Blows up the Zonetracker after it has collided with an object.

PROCEND

200,880

Disintegrates the Gridd after about 75 percent of it has been destroyed.

PROCGRIDD

90,1020

Redefines character 224 depending upon the number of Gridds completed.

PROCHIGH

240,900

Contains the input routine for the name of the high scorer.

PROCINIT

20,340

Initialises the main variables as used in the assembler code and calls PROCAss (o%).

PROCINITSCREEN

30,860

Prints up the title page.

PROCRND

140,710

Randomly selects a drone and changes the x and y co-ordinate increments in order that it may chase the Zonetracker.

PROCRNDCHAR

260,750

Randomly defines the character stored by the variable c% to design the drones — this way new drones are defined on each game.

PROCSC

480,850

Displays the score at the bottom of the screen.

PROCSCREEN

90,270

Draws out the screen at the start of play.

PROCSNAKE

150,410

Controls Zonetracker movement.

PROCVARI

100,330

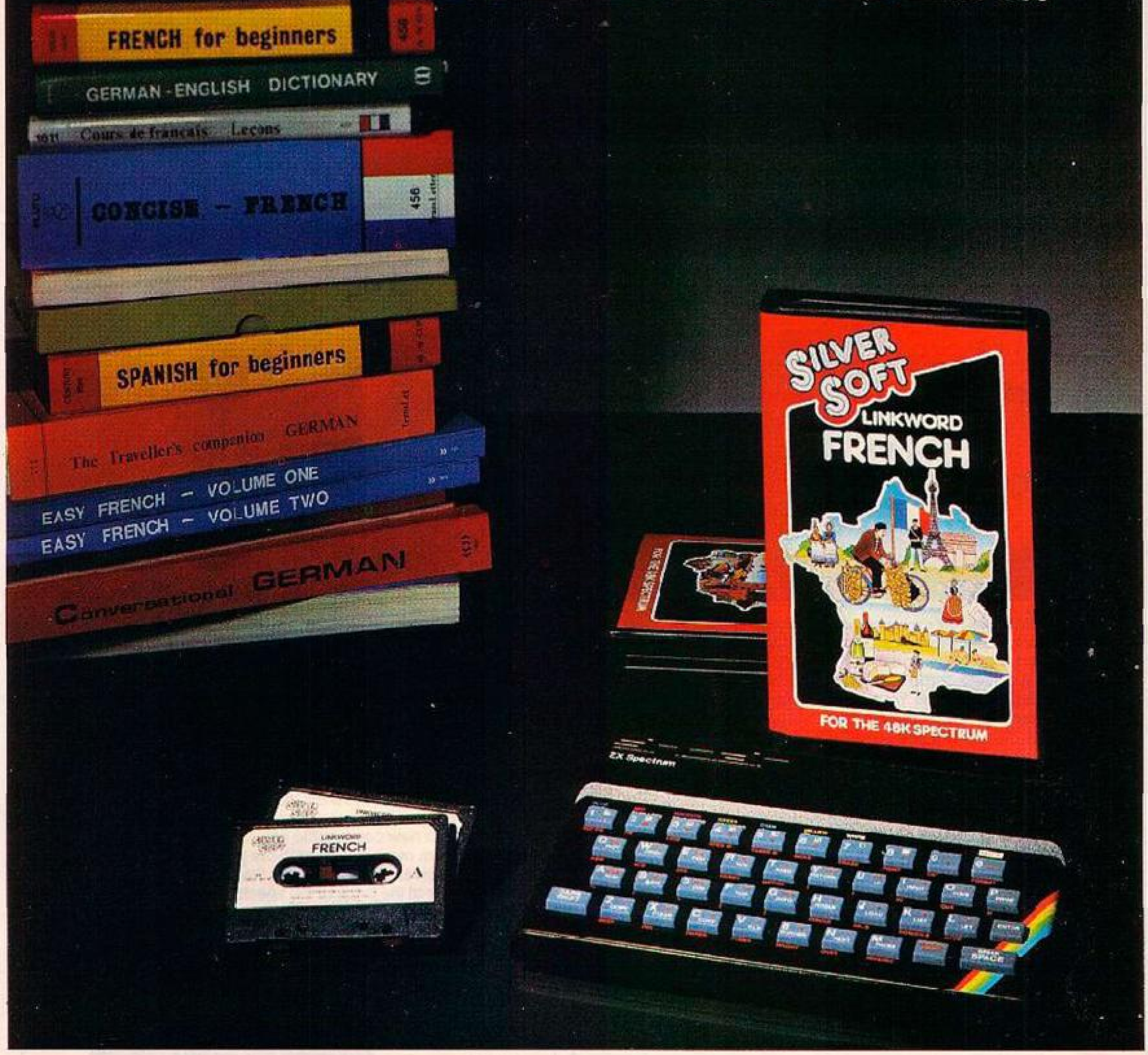
Initialises the main variables for each new screen.

PROCW

80,200,240,250 700,900

Writes out the text passed it by A$.

# COMPUTER LANGUAGES...




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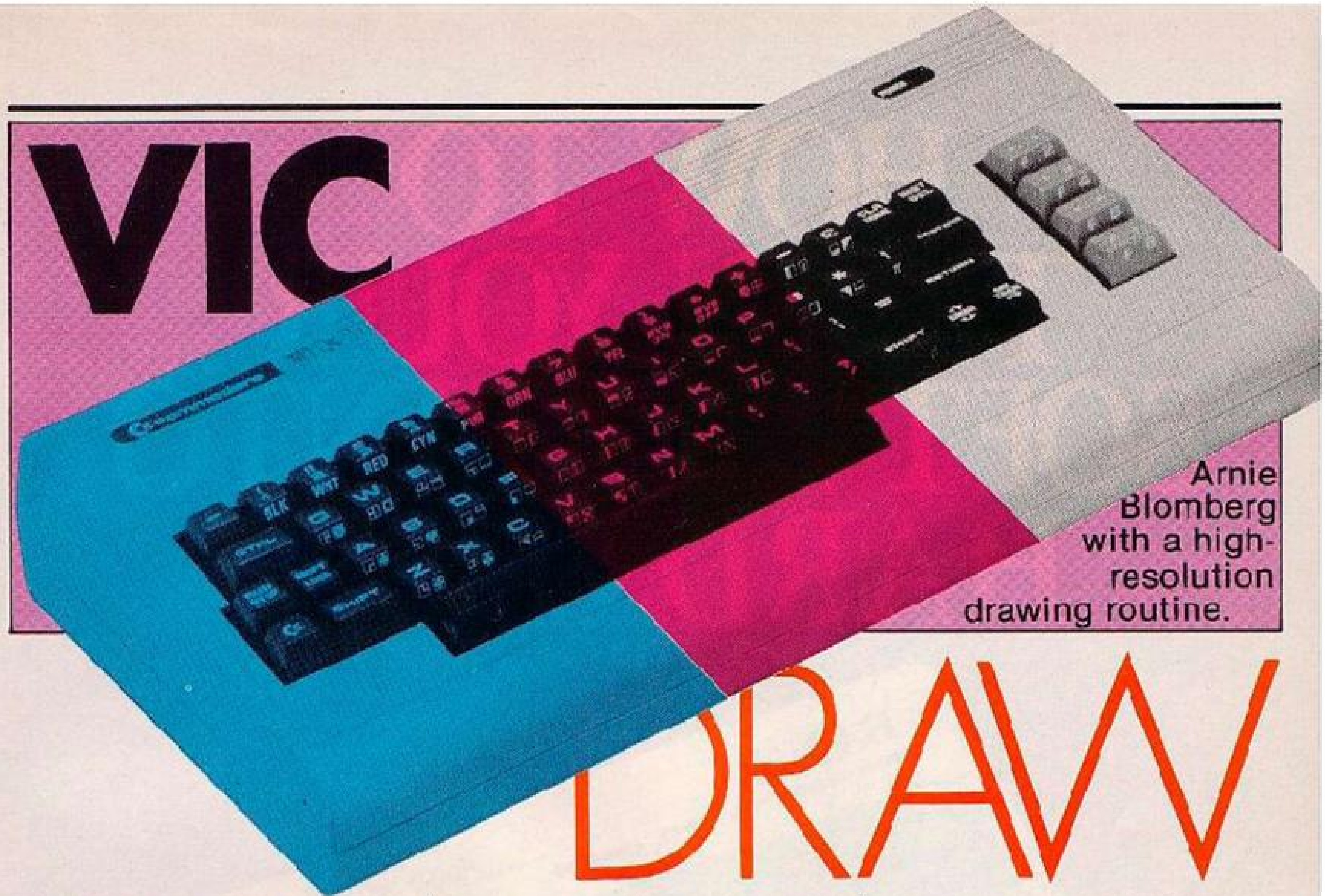
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SILVER SOFT

# VIC DRAW




Arnie Blomberg with a high-resolution drawing routine.

MANY VIC-20 OWNERS often look at other computers with envy, when they see the high-resolution capabilities that most of them have. You can, of course, buy the Super-Expander cartridge, but if you cannot afford it, or would like to try without it, and have 8K or more RAM expansion, then this is the answer for you.

The program gives you a high-resolution drawing screen, 176 pixels wide by 160 high, totalling 28,160 pixels, with a small instruction and input text-window beneath.

The functions in the program are:

**Point** for placing one single pixel at horizontal and vertical co-ordinates that you input.

**Draw** a line between two sets of co-ordinates.

**Square** draws a square on the line co-ordinates.

**Triangle** on the line co-ordinates.

**Circle** from the centre co-ordinates and the radius

**Elipse** from centre, two radii and angle of inclination.

**Zpiral** — yes, deliberately mis-spelt Centre, size — tightness of arms — and number of revolutions.

**Lines** This creates an interference pattern effect, caused by a succession of lines filling the screen.

All the functions are controlled by single-key input from the main menu in the text window. Hence Zpiral with a "Z", to avoid confusion with Square.

Other functions are:

**Erase** by pressing the minus key and then the drawing function.

**Load/Save key f1,** then L or S. You can Save or Load drawings to or from tape as shown by the prompts. If you have 16K or more RAM, you can Save the contents of two whole screens in memory and, Load it back.

**Clear Screen** by shifted CLR/home.

**Break** from drawing Circles, Elipses, Zpirals or Lines by pressing B.

**Mistake?** Press M during most of the input sequences.

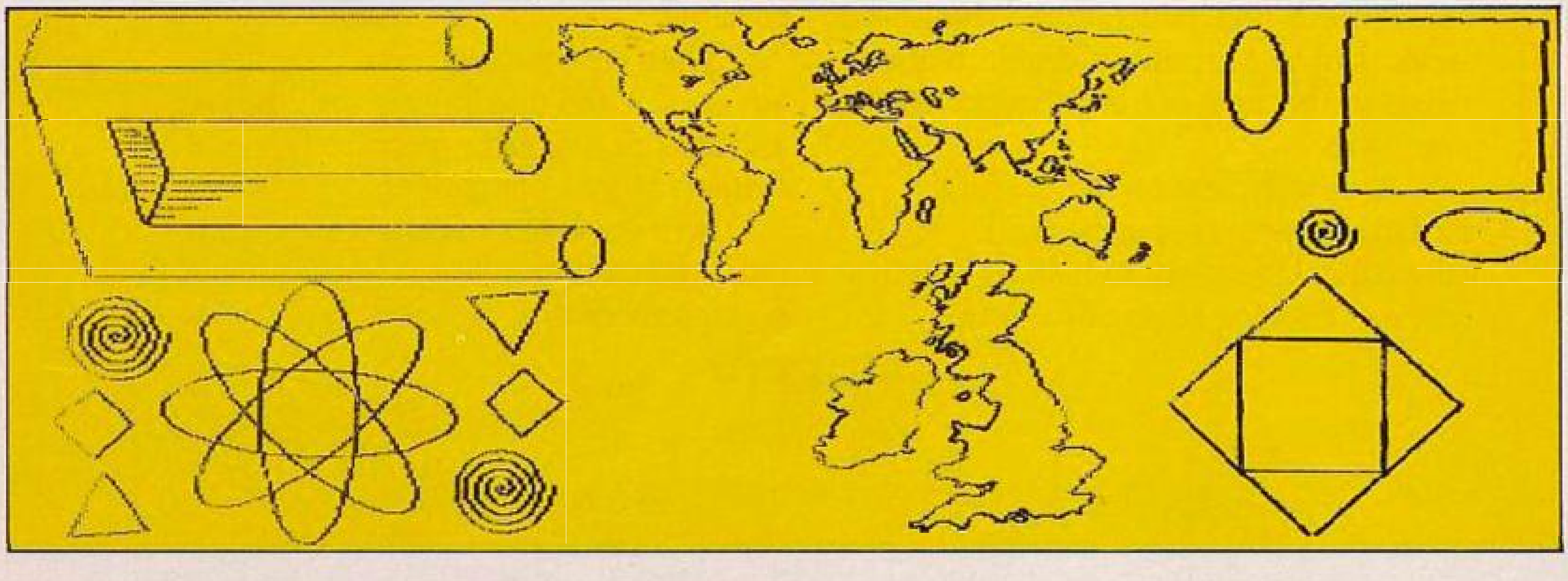
The small text is three by five pixels and is stored as complete words in the machine-code and data routine in bytes 8192-9727.

The Instructions and Input prompts are shown on two lines in the text window, leaving an area four pixels high at the bottom of the window. This area records the details of your last command, but at three by four pixels some letters and numerals are slightly unclear — just good enough to remind you what you have just done.

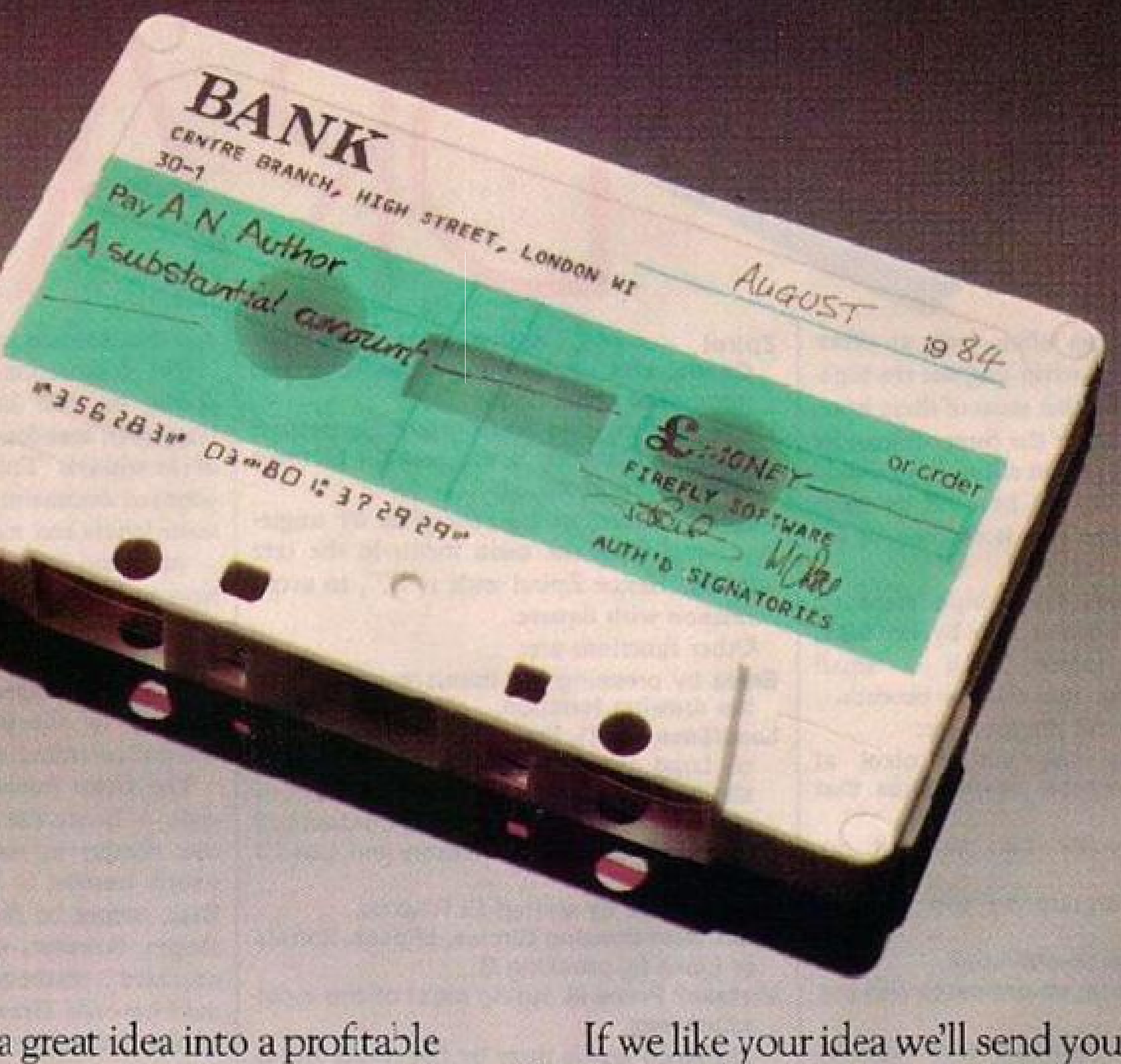
The program is a hybrid of machine code and Basic; machine code for speed in setting up the bit-mapped screen, and calculating positions of the pixels from horizontal and vertical co-ordinates.

The Draw function is entirely in machine code — hence the speed — also most of the text display as well as the transfer of the screen content to and from RAM memory. Basic would be far too slow. The spherical shapes, however, are calculated in Basic, by standard mathematical formulae, using machine-code Draw between frequent points on the circumference.

*(continued on page 111)*



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*(continued from page 109)*

If you are interested in dis-assembling the machine code, here is a brief summary of the routines:

8192-8238 — clears text window.
8240-8394 — prints various parts of text in text window.
8400-8529 — Sets up bit-mapped screen.
8530-8605 — Plots pixel positions on screen.
8606-8659 — More text printing.
8660-8932 — Calculating Draw function.
9368-9351 — Transfer screen to RAM and vice versa.

The gaps in between and up to 9727 are filled by character store for words and numerals, and more text printing. The variables P9 and PS, which are used in all drawing inputs, are pointers to character store and their positions in the text window.

The numeric-input routine is in Basic lines 1600 to 1640. It has a built-in protection so that you cannot input more than three digits, or a number larger than the screen dimensions. Press Return after each number input.

Here is how to enter the listings: start with listing 1, the machine-code data loader. Note the Rems in lines 100 and 240 must be kept until the program has been typed in full. They allow you to run the program and test that the data is correct.

The checksum on each line verifies the accuracy of the data on that line, but not any missing or out-of-sequence lines — so check this carefully yourself to avoid frustrating crashes or other faults in the program. Ignore the fact that the screen tells you that the data is stored in memory at this stage — the Rems have prevented this.

When you have finished typing and checking it, remove the two Rems and save the loader program on tape. This should be saved as the first item on another tape. It will cause the start of the main high-resolution program to be loaded from byte 9728, instead of 4608, as the bit-mapped screen and machine codes use 5.5 of RAM. The Basic Move incorporates an automatic Load/Run for the next program.

Finally we come to listing 3 — the main hi-res draw program. Type it very carefully, especially all Poke and Sys entries. You cannot run it at all at this stage. When finished, save it immediately after the Basic Move.

Now load and run the programs in the following sequence:

1. Basic Move program, but press the Run/Stop key as soon as the word Load appears on the screen, as we do not want the main hi-res program yet.
2. The machine-code data loader.
3. The main hi-res draw program. This has a built-in routine at line 50000, which will save the machine-code data in a shorter format. To do so merely type RUN50000 and save it on tape after the main program. Then all the parts of the program will load and run in one sequence.

Now, with any luck, you should have a clear screen, with the main menu in the text window. If there are any mistakes in the main program, garbage will appear in the text window. To see what the error is type

GOTO5

and press Return without clearing the screen. It will return to normal text mode, and the error message can be read in the lower half. Clear the screen now, before changing any part of the program.

If the program crashes — that is, everything stops working — or if it stops with Ready on a clear screen, re-check the Poke and Sys

*(continued on next page)*

*Listing 1.*

```
10 REM ** MACHINE CODE AND DATA LOADER
20 REM** KEEP REM'S INLINES 100 & 240 W
HILE TESTING FOR CORRECT COPY OF DATA
 IN LIST.
100 REM IF PEEK(44)<38THENPRINT"RUN B
ASIC MOVE PROGRAM FIRST -THEN RELOAD":E
ND
150 PRINT"PLEASE WAIT !!"
200 FORI=0TO95:LC=8132+I*16:CT=0
210 FORJ=0TO15:READ A:CT=CT+A
240 REM   POKE LC+J,A
250 NEXT
270 READ A:IFA<>CTTHENPRINT"ERROR IN LI
NE"LC:END
290 NEXT
300 PRINT"THE MACHINE CODE IS NO
W STORED IN MEMORY- LOAD THE HI-RES
PROG.":END
8192 DATA169,11,133,253,76,12,32,234,
   169,16,133,253,169,240,133,254, 2287
8208 DATA169,0,133,251,169,31,133,252,
   169,0,160,0,145,251,200,196, 2259
8224 DATA253,200,240,24,160,10,101,251,
   133,251,197,254,238,234,96,234, 2878
8240 DATA169,15,133,254,208,42,32,152,
   32,32,88,32,169,55,133,254, 1800
8256 DATA169,75,133,249,169,6,208,28,
   169,15,208,2,169,10,133,254, 2025
8272 DATA139,130,133,249,169,43,220,10,
   169,75,133,254,169,0,133,249, 2296
8288 DATA139,0,133,251,169,35,133,250,
   169,5,133,253,169,31,133,252, 2285
8304 DATA135,249,141,127,32,165,250,141,
   128,32,162,0,160,2,169,75, 2016
8320 DATA35,145,251,232,220,254,200,1,
   96,200,196,253,200,240,24,159, 2740
8336 DATA13,101,251,133,251,76,124,32,
   169,104,133,249,169,192,133,251, 2384
8352 DATA139,11,133,253,165,22,133,254,
   169,36,133,250,160,29,76,110, 2116
8368 DATA32,169,72,133,249,169,224,133,
   251,169,16,133,253,169,32,75, 2200
8384 DATA136,32,169,30,133,254,169,225,
   76,54,32,166,160,164,162,76, 2116
8400 DATA139,0,160,170,157,0,30,232,24,
   105,10,201,215,144,245,200, 2074
8416 DATA152,201,10,208,235,142,219,30,
   232,142,221,30,232,142,222,30, 2452
8432 DATA232,142,239,30,232,142,240,30,
   160,0,139,240,153,224,30,200, 2463
8448 DATA24,105,1,201,255,208,245,165,6,
   162,0,157,0,150,232,224, 2139
8464 DATA220,208,240,162,1,142,220,150,
   142,223,150,142,241,150,169,2, 2570
8480 DATA152,0,157,224,150,232,224,16,
   208,240,169,16,133,252,169,0, 2360
8496 DATA133,251,160,0,169,0,145,251,
   200,208,251,230,252,165,252,201, 2808
8512 DATA30,208,241,162,4,142,221,156,
   142,222,150,142,239,150,142,240, 2585
8528 DATA150,38,127,191,223,239,247,251,
   253,254,128,64,32,16,8,4, 2283
8544 DATA2,1,165,254,20,175,144,196,
   165,253,201,159,144,196, 2058
8560 DATA159,16,133,252,165,254,41,248,
   133,251,162,19,24,101,251,144, 2383
8576 DATA2,230,252,202,208,240,24,101,
   253,144,2,230,252,133,251,155, 2655
8592 DATA254,41,7,170,160,0,177,251,29,
   90,33,145,251,96,169,70, 1943
8608 DATA133,254,169,0,133,249,133,251,
   169,36,76,102,32,169,15,32, 1953
8624 DATA160,33,169,35,133,254,133,249,
   169,40,208,234,169,25,133,234, 2406
8640 DATA169,224,133,249,169,6,208,222,
   169,15,133,254,169,189,133,249, 2691
8656 DATA169,150,208,230,169,0,162,10,
   149,86,202,208,251,165,248,197, 2604
8672 DATA247,176,12,56,165,247,229,248,
   133,89,169,198,76,245,33,229, 2552
8688 DATA247,133,89,169,230,141,23,34,
   165,250,197,249,176,12,56,155, 2336
8704 DATA249,229,250,133,93,169,198,76,
   6,34,229,249,133,93,169,230, 2556
8720 DATA141,22,34,73,26,34,199,230,234,
   234,165,93,197,89,234,234, 2241
8736 DATA144,27,133,87,133,94,165,89,
   133,95,160,247,162,249,173,23, 2114
8752 DATA34,141,220,34,173,22,34,141,
   222,34,76,85,34,133,95,165, 1843
8768 DATA89,133,87,133,94,160,249,162,
   247,123,23,34,141,222,34,173, 2154
8784 DATA22,34,141,220,34,140,221,34,
   142,223,34,165,94,197,95,200, 2024
8800 DATA25,169,255,133,90,133,91,132,
   92,76,174,34,169,4,133,253, 1965
8816 DATA159,252,133,254,169,60,76,16,
   32,234,234,165,95,160,24,6, 2091
8832 DATA58,38,91,38,92,10,144,18,133,
   90,169,255,229,94,101,90, 1694
8848 DATA230,90,208,6,230,91,208,2,230,
   92,197,94,144,12,229,94, 2157
8864 DATA230,90,208,6,230,91,208,2,230,
   92,136,208,210,234,230,87, 2492
8880 DATA169,0,133,94,133,95,169,128,
   234,234,133,96,165,247,133,254, 2417
8896 DATA165,249,133,253,32,99,33,24,
   165,94,101,90,133,94,165,95, 1924
8912 DATA101,91,133,95,165,96,101,92,
   133,96,144,2,198,249,230,247, 2173
8928 DATA198,87,208,216,96,169,6,133,
   251,169,206,208,6,169,80,133, 2339
8944 DATA251,169,214,133,249,169,10,133,
   254,169,36,76,102,32,0,0, 1997
8960 DATA196,170,202,138,132,165,160,
   172,164,164,132,128,128,128,128,236,
   2623
8976 DATA170,172,170,202,74,170,234,174,
   170,0,0,0,0,0,75,170, 1781
8992 DATA135,170,74,18,172,34,170,142,
   56,32,48,32,184,232,136,200, 1842
9008 DATA136,236,179,170,179,160,183,
   184,32,176,160,184,236,42,76,138,
   2449
9024 DATA232,177,170,179,170,170,32,160
   160,160,184,238,74,76,74,74, 2329
9040 DATA146,171,186,170,170,72,84,200,
   60,70,0,0,0,0,0,220, 1597
9056 DATA138,234,42,230,164,170,174,170,
   186,206,166,204,160,174,0,0, 2348
9072 DATA0,0,0,130,139,138,138,234,93,
   81,217,80,53,192,0,192, 1735
9088 DATA64,152,78,168,140,168,78,151
   210,170,146,140,183,64,132,84, 2092
9104 DATA87,4,10,14,0,10,150,213,101,
   145,150,24,21,25,21,21, 1090
9120 DATA153,65,213,85,89,83,84,82,81,
   54,132,138,138,138,228,75, 1855

9136 DATA170,234,170,172,0,0,32,32,64,
   228,138,230,42,234,174,168, 2096
9152 DATA172,160,70,4,10,10,10,4,192,
   160,192,160,160,130,210,170, 1846
9168 DATA130,130,230,132,220,36,228,74,
   172,236,170,170,230,129,194,128, 2641
9184 DATA228,228,74,70,74,74,206,158,
   204,136,142,4,10,10,10,4, 1640
9200 DATA192,160,192,160,160,196,170,
   206,170,170,136,216,158,136,136,70
   2646
9216 DATA204,170,204,138,138,238,136,
   206,130,230,224,120,224,32,224,208
   2840
9232 DATA168,204,168,174,68,170,138,170,
   83,204,170,202,170,172,12,16, 2276
9248 DATA88,21,14,2,10,12,0,0,132,138,
   112,138,234,160,160,64, 1261
9264 DATA64,64,73,173,171,169,73,0,0,0,
   0,0,228,74,78,74, 1241
9280 DATA74,205,168,204,136,145,0,0,136,
   149,149,149,201,0,201,145, 2064
9296 DATA221,85,212,0,174,200,172,174,
   152,85,212,85,80,0,80,81, 2029
9312 DATA86,81,152,0,173,169,77,73,216,
   149,217,149,213,0,173,201, 2131
9328 DATA205,168,172,155,82,219,74,91,0,
   64,64,75,128,128,169,55, 1853
9344 DATA173,254,169,170,76,94,32,169,
   12,133,251,169,12,133,254,169, 2230
9360 DATA37,133,250,169,4,76,106,32,169,
   0,133,251,133,253,168,162, 2076
9376 DATA14,177,251,145,253,200,208,249,
   230,252,230,254,202,208,242,96, 3211
9392 DATA172,162,228,166,174,172,162,
   164,168,78,0,0,0,233,173,235, 2289
9408 DATA169,168,36,84,68,84,55,112,78,
   96,78,112,196,178,226,170, 1867
9424 DATA170,192,78,64,78,224,198,170,
   206,170,170,192,46,64,142,224, 2383
9440 DATA275,138,233,42,235,186,168,58,
   32,185,134,130,86,130,199,24, 2312
9456 DATA85,85,85,34,0,60,0,60,0,172,
   154,164,164,78,0,0, 1151
9472 DATA156,170,202,132,165,160,172,
   154,192,128,128,128,201,149,85,205,
   2597
9488 DATA73,85,93,213,156,80,152,92,236,
   74,76,74,145,171,186,170, 2077
9504 DATA72,80,220,72,204,170,172,202,
   72,168,231,165,126,120,0,0, 2084
9520 DATA127,130,139,106,26,162,34,155,
   58,32,46,184,232,136,200,238, 1993
9536 DATA179,170,177,183,112,64,98,112,
   238,74,140,232,177,170,179,170, 2451
9552 DATA37,160,160,184,130,139,138,234,
   93,81,216,93,128,0,128,128, 2052
9568 DATA150,85,82,68,231,73,170,172,
   170,73,174,168,172,160,76,164, 2226
9584 DATA170,234,170,164,172,164,228,
   164,174,14,10,10,10,14,12,4, 1714
9600 DATA4,4,14,12,2,4,8,14,14,2,8,2,14,
   8,10,14, 132
9616 DATA2,2,14,8,14,2,14,4,8,14,10,14,
   14,2,4,6, 134
9632 DATA8,14,10,14,10,14,14,10,14,2,8,
   14,10,14,14,10, 170
9648 DATA10,14,12,4,4,14,12,2,4,14,12,4,
   2,14,8,10, 140
9664 DATA14,2,14,12,2,14,8,14,10,14,14,
   2,4,8,10,4, 143
9680 DATA10,14,14,10,14,2,0,87,84,38,39,
   0,112,64,48,112, 648
9696 DATA32,108,34,169,0,170,157,204,29,
   157,220,29,232,224,4,208, 1577
9712 DATA245,159,29,141,152,33,169,90
   141,53,33,36,0,0,0,0, 1451
```

*(continued from previous page)*

numbers, or the machine-code data lines.

Unfortunately the Vic-20 pixel is much wider than it is high, so that if we want symmetrical squares and triangles, and circles, which are not elongated the horizontal co-ordinates have to be adjusted. This is done in line 40

DEFFNR(B) = B*.58

That is, the horizontal numbers are reduced by multiplying their value by .58. You can change the value here yourself to suit your own television screen. Try =B*1 to see what a normal Vic circle and square would look like.

Although the hi-res screen is 176 true pixels wide, the adjustment factor also means that you have to input a higher number to reach the right-hand edge — in fact 175/.58 (=301) for this particular adjustment factor. You can check what the maximum is by finding the highest number you can input as a horizontal co-ordinate.

There is a check to prevent drawing outside of the screen area, and this can result in triangles and squares having one or more sides missing, if any part of them lies beyond the edge. Spherical shapes also lose parts that lie outside of the screen. The machine-code routine lets you Draw, Square and Triangle in all directions.

A limited possibility of changing the colour of the drawn pixel can be found by changing line 70 —

Poke8456,(any number from 0 to 7)

In the same line is also the screen/border colour:

POKE 36879,25

Try

POKE 36879,225

for the reverse negative effect.

Change the variables in line 1220 — the lines routine for different patterns. Sometimes you get illegal quantity error here — type Goto5 — but no harm is done.

With no more than 3K expansion you can leave out lines 1000-1090 which operate picture storage in RAM. If you hope to upgrade later, type them in as the program checks if you have enough memory for storage.

With 24K you can store four pictures by making this change:

1042 IFQ<1ORQ>4 etc

The prompt will still read 1-2 = unless you want to redesign it to 1-4 in character store 9568-9572.

If you have a 1520 printer and would like a hard copy of your drawings, add the lines in listing 4 to the main program, and key f8 from the prime menu to activate the printer.

Finally, if you prefer not to type the program yourself, send a cheque or PO for £2.50 to me for a copy on tape, with some drawings including outline maps of the British Isles, and the World. Specify if you want the 1520 addition. 134 Aldebury Road, Maidenhead, Berkshire SL6 7HE. ■

*Listing 2.*

```
10 REM ** TO MOVE START OF BASIC TO PAGE
 38 (9728), WITH LOAD/RUN
20 POKE198,1:POKE631,131
40 POKE44,38:POKE38*256,0:NEW
```

*Listing 3.*

```
1 GOTO10
2 REM  ** NEEDS 8K OR MORE EXPANSION RA
M
5 REM ** IF PROG.STOPS DUE ERROR,TYPE 'G
OTO5'(BLIND) TO READ ERROR MESSAGE
7 POKE36869,240:POKE36867,46:END
10 IFPEEK(44)<38THENPRINT"RUN BASIC
MOVE FIRST":END
20 IFPEEK(8200)=169ANDPEEK(8200)=169 THE
N30
25 PRINT" LOADING MACHINE CODE   DAT
A":LOAD"",1,1
30 POKE36869,240: POKE648,30: POKE36866
,150:PRINT"
35 POKE52,64:POKE56,64:CLR
40 DEFFNR(B)=B*.58 REM ** TO COMPENSATE
 FOR WIDE VIC PIXEL
50 DIMBN(3),TQ(1):BN(0)=16:BN(1)=1:BN(2
)=16:BN(3)=1:TQ(0)=175/FNR(1):TQ(1)=159

60 POKE36867,23:POKE36866,252
70 POKE36879,25:POKE8456,6:REM*CHANGE V
ALUES HERE FOR NEW COLOURS
100 SYS8400:SYS8200
120 SYS8344:SYS8303
130 SYS8192:SYS8245
135 GETX$:IFX$=""THEN135
140 SYS8192:IFX$="-"THEN700
145 IFASC(X$)=147THEN100
150 IFASC(X$)=133THEN800
155 IFX$="P"THEN200
160 IFX$="D"THEN300
165 IFX$="S"THEN300
170 IFX$="C"THEN400
175 IFX$="T"THEN305
180 IFX$="E"THEN500
185 IFX$="Z"THEN600
190 IFX$="L"THEN1220
195 GOTO130
199 SYS9351:GOSUB1755:GOTO130
200 POKE249,0:SYS8240
210 NI=-1:PS=7984:P9=9583:GOSUB1600:X=FN
R(Q):IFMFTHEN130
215 PS=8204:P9=9570:GOSUB1600:Y=Q:IFMFTH
EN130
220 POKE254,X:POKE253,Y:SYS8580
230 POKE249,0:GOTO199
300 SQ=4:POKE249,95:CS=12:GOTO310
305 SQ=3:POKE249,75:CS=24:GOTO310
309 SQ=1:POKE249,15:CS=36
310 SYS8242:PS=7984:P9=9588:NI=-1:GOSUB1
600:X3=FNR(Q):IFMFTHEN130
315 PS=8248:P9=9465:GOSUB1600:Y3=Q:IFMFT
HEN130
322 P9=9392:PS=7992:GOSUB1600:X4=FNR(Q):
IFMFTHEN130
325 P9=9397:PS=8054:GOSUB1600:Y4=Q:IFMFT
HEN130
340 X1=X3:Y1=Y3
345 FORK=1TOSQ:GOSUB905
350 TX=(X4-X3)/FNR(1):TY=Y4-Y3
370 X3=X4:Y3=Y4:ONSQGOTO390,375,372
372 X4=X4-FNR(TY):Y4=Y4+TX:GOTO390
375 IFK>1THEN385
377 TL=SQR(TX↑2+TY↑2):TW=SQR(TL↑2-(TL/2)
↑2):Y4=Y4+TW*(TX/TL)-TY/2
382 X4=X4-FNR((TY/TL)*TW)-FNR(TX/2):GOTO
390
385 X4=X1:Y4=Y1
390 NEXTK:POKE249,CS:GOTO199
400 POKE249,30:SYS8240:SYS8268
405 NI=-1:P9=9583:PS=7942:GOSUB1600:H1=F
NR(Q):IFMFTHEN130
410 P9=9578:PS=8022:GOSUB1600:V1=Q:IFMFT
HEN130
415 PS=8102:P9=9420:GOSUB1600:RA=Q:IFMFT
HEN130
420 IN=5/RA:A=2*π
430 FORI=0TOASTEPIN
445 X4=FNR(RA*SIN(I))+H1:Y4=RA*COS(I)+V1
450 IFPEEK(197)=35THENI=A:NEXT:GOTO490
455 IFI=0THENX3=X4:Y3=Y4:X1=X4:Y1=Y4
460 GOSUB935
470 Y3=Y4:X3=X4:NEXT:Y4=Y1:X4=X1:GOSUB94
0
490 POKE249,48:GOTO199
500 POKE249,45:SYS8240
510 SYS8204:P9=9583:PS=8040:NI=-1:GOSUB1
600:H1=FNR(Q):IFMFTHEN130
515 P9=9578:PS=8112:GOSUB1600:V1=Q:IFMFT
HEN130
520 SYS8933:PS=7942:GOSUB1604:R1=Q:IFMFT
HEN130
530 SYS8941:PS=8022:GOSUB1604:R2=Q:IFMFT
HEN130
540 SYS8848:PS=8102:GOSUB1604:AN=Q*π/180
:IFMFTHEN130
545 REM** ELIPSE CALCULATION STARTS HERE
550 A=2*π:A1=COS(AN):A2=SIN(AN):IN=3/R1:
IFR2<R1THENIN=3/R2
560 FORI=0TOASTEPIN
565 X2=R1*COS(I):Y2=R2*SIN(I)
570 X4=FNR(X2*A1-Y2*A2)-H1:Y4=X2*A2+Y2*A
1+V1
575 IFI=0THENX3=X4:Y3=Y4:X1=X4:Y1=Y4
580 IFPEEK(197)=35THENI=A:NEXT:GOTO590
585 GOSUB935:X3=X4:Y3=Y4:NEXT:X4=X1:Y4=Y
1:GOSUB940
590 POKE249,60:GOTO199
600 POKE249,60:SYS8240:SYS8264
605 P9=9583:PS=8040:NI=-1:GOSUB1600:H1=F
NR(Q):IFMFTHEN130
610 P9=9578:PS=8112:GOSUB1600:V1=Q:IFMFT
HEN130
615 SYS8836:PS=7990:GOSUB1604:RA=(Q+2)/6
:IFMFTHEN130
620 IFQ<2ORQ>100THENGOSUB1730:GOTO615
625 PS=8254:P9=9285:GOSUB1590:PS=8070:PS
=8395:GOSUB1600:RU=Q:IFMFTHEN130
630 S=1/RA:A=2*π:FORJ=0TORU-1:IN=S/(J+1
)*2)
635 FORI=0TOA+IN STEP IN:K=I+J*π*2
640 X4=FNR(H1+RA*K*COS(K)):Y4=V1-RA*K*SI
N(K)
645 IFI=0THENX3=X4:Y3=Y4:X1=X4:Y1=Y4
650 IFPEEK(197)=35THENI=A+IN:J=RU-1:GOTO
690
675 GOSUB935:X3=X4:Y3=Y4
690 NEXT:NEXT:POKE249,72:GOTO199
700 POKE8600,61:POKE8601,82
710 P9=9836:PS=7627:GOSUB1590:P9=9691:PS
=7843:GOSUB1590:GOTO130
800 SYS9342
810 GETZ$:IFZ$=""THEN810
815 IFZ$="M"THEN130
820 IFZ$<>"S"ANDZ$<>"L"THEN810
830 IFPEEK(644)>63THENGOSUB1000:IFA$="R"
THEN1040
840 IFZ$="S"THENSYS8506:GOSUB900:GOTO890
850 IFZ$="L"THENSYS8102:SYS8611:GOSUB900
880 POKE781,0:POKE782,15:POKE780,3:SYS65
493:GOTO130
890 POKE780,0:POKE781,192:POKE782,29:POK
E0,0:POKE1,16:SYS65496:GOTO130
900 IFPEEK(197)=35THEN130
905 IF(PEEK(37143)AND2)THEN900
910 PS=7942:P9=9573:GOSUB1590:GOSUB950:R
ETURN
935 IFX4>175ORX4>176ORX3>159ORX3>176ORX3
<0ORY3<0ORX4<0ORY4<0THENRETURN
940 IFX3=X4ANDY3=Y4THENRETURN
945 POKE247,X3:POKE248,X4:POKE249,Y3:POK
E250,Y4:SYS8600:RETURN:REM ** DRAW ROUT
INE
950 REM M/C SAVE-LOAD SETUP
955 POKE780,1:POKE781,1:POKE782,255:SYS6
5466:POKE780,0:SYS65469:RETURN
1000 SYS8192:SYS8386
1020 GETA$:IFA$=""THEN1020
1025 IFA$<>"T"ANDA$<>"R"THEN1020
1030 RETURN
1040 P9=9568:PS=7942:NI=0:GOSUB1600:IFMF
THEN130
1042 IFQ<1ORQ>2THENGOSUB1730:GOTO1040
1045 Q=60-14*(Q-1)
1050 IFZ$="S"THENPOKE252,15:POKE254,Q:SY
S9368:GOTO130
1080 POKE252,Q:POKE254,16:SYS9368
1090 GOTO130
1200 REM*LINE PATTERNS--ALTER THE VARIA
BLESIN LINE 1220 FOR NEW  PATTERNS

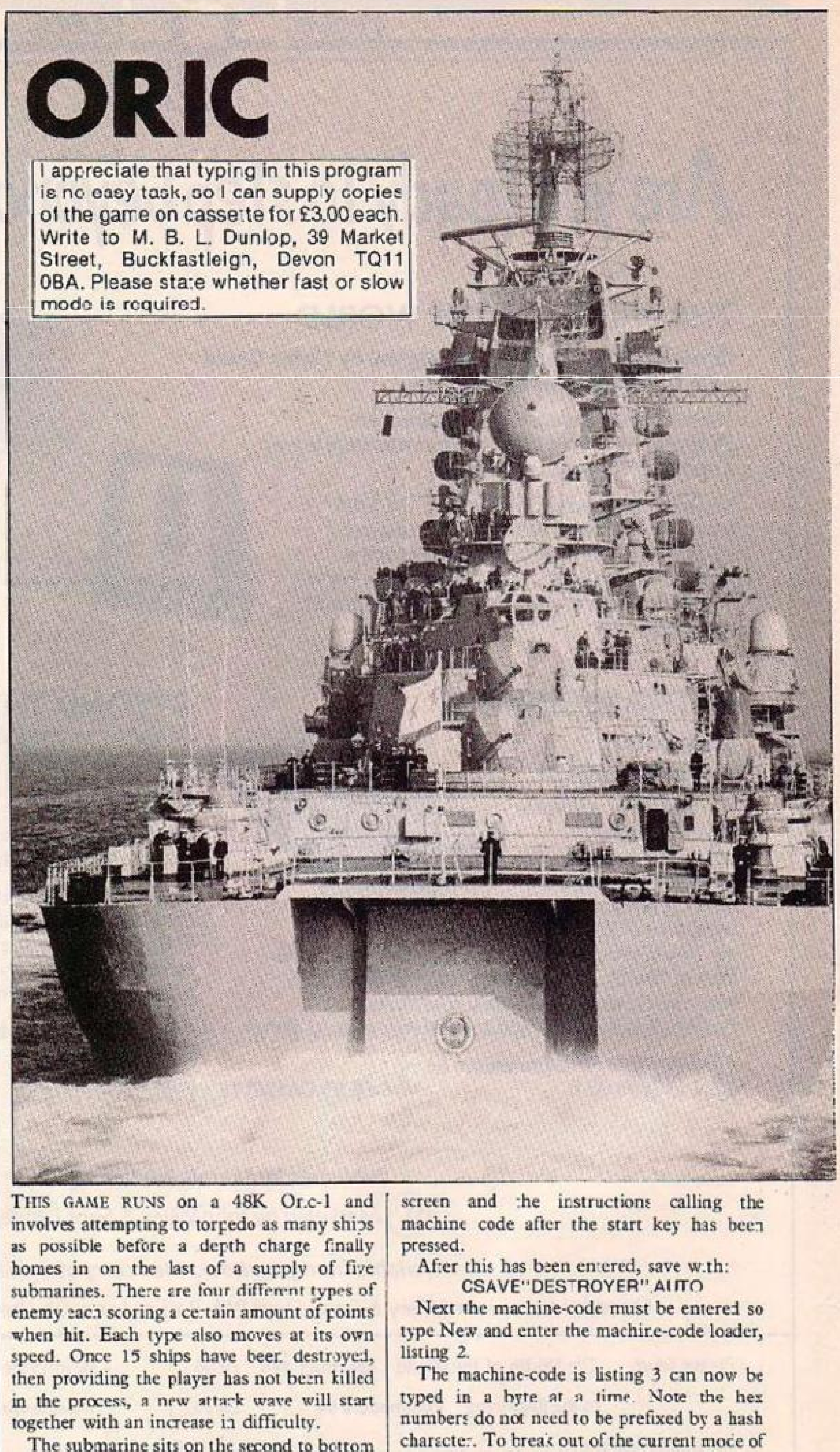
1210 REM ** MI= MIDDLE- ED= EDGES-  S= S
TART-A= FINISH
1220 MI=1.5:ED=0.5:A=250:S=0:IN=MI:IF ED
>MI THEN IN=ED
1230 M=S:E=0:FORJ=S TO A STEP IN:X3=0:X4
=87:Y3=E:Y4=M:GOSUB940
1240 X3=87:X4=175:Y3=M:Y4=E:GOSUB940:E=E
+ED:M=M+MI
1250 IFPEEK(197)=35ORPEEK(197)=36THENJ=A
1260 NEXT:POKE249,84:SYS9351:SYS9696:GOT
O130
1590 FORI=0TO4:POKEPS+I,PEEK(P9+I):NEXT:
RETURN
1595 POKEPS+17,120:POKEPS+19,120:RETURN
1600 GOSUB1590:GOSUB1595
1604 NI=NI+1:OD=(NI/2-INT(NI/2))*2
1605 X$="":CT=0:I=0
1610 GETA$:IFA$=""THEN1610
1612 MF=0:IFA$="M"THENMF=1:RETURN
1615 IFASC(A$)=13ANDX$<>""THENN(NI)=Q:RE
TURN
1620 IFA$<"0"ORA$>"9"THEN1610
1625 X$=X$+A$:Q=VAL(X$):GOSUB1700:CT=CT+
1
1630 IFQ>TQ(OD)ORLEN(X$)>3THENGOSUB1730:
GOTO1605
1640 GOTO1610
1700 A=VAL(A$):PZ=PS+32+16*(CT>1)
1710 P9=9593+A*5:FORI=0TO4:POKEPZ+I,PEEK
(P9+I)*BN(CT)ORPEEK(PZ+I):NEXT:RETURN
1730 FORJ=0TO1:PZ=PS+32+J*16:FORK=0TO4:P
OKEPZ+K,0:NEXTK,J:RETURN
1755 SYS9696:FORI=0TONI:N$=MID$(STR$(N(I
)),2):N=LEN(N$):PS=7996+I*32
1770 FORJ=0TON-1:A=VAL(MID$(N$,J+1,1)):P
S=PS+INT(J/2)*16:P9=9593+A*5:FORK=0TO3
1780 POKEPS+K,PEEK(P9+K)*BN(J)ORPEEK(PS+
K):NEXTK,J,I:RETURN
50000 REM ** SAVE MACHINE CODE ROUTINE F
ROM 8192 TO 9727
50010 GOSUB950:POKE780,0:POKE781,0:POKE7
82,38:POKE0,0:POKE1,32:SYS65496
```

*Listing 1.*

```
5 REM FOR & READ HASH CHARACTER
50 DOKE&400,DEEK(&9C):CLOAD"DESTROYER2":
DOKE&9C,DEEK(&400):CLEAR
55 POKEA13,10:POKE&20,20:DOKE&21,47960
60 GOSUB900
70 DOKE&406,0:DOKE&408,0:DOKE&40A,0
90 PAPER0:INK2:CLS
95 PRINT" "CHR$(27)"U  PRESS 'P' TO PLAY
"
97 PRINT:PRINT:PRINT:PRINT
100 PRINT"ss  sss sss sss sss sss s s ss
s sss"
110 PRINT"s s s   s     s  s s s s s s s
  s s"
120 PRINT"s s s   s     s  s s s s s s s
  s s"
130 PRINT"s s sss sss   s  ss  s s  s  ss
s ss "
140 PRINT"s s s     s   s  s s  s s  s  s
  ss "
150 PRINT"s s s     s   s  s s s s  s  s
  s s"
160 PRINT"ss  sss sss   s  s s sss  s  ss
s s s"
165 PRINT:PRINT:PRINT" "CHR$(4)CHR$(27)"
J"CHR$(27)"EBY MYLES DUNLOP"CHR$(4)
170 PRINT:PRINT
180 PRINT" "CHR$(27)"FONLY YOU CAN STOP
THE INVASION"
195 A$="":FORI=&405TO&406STEP-1:A$=A$+CH
R$(PEEK(I)+&30):NEXT
196 PRINT:PRINT" "CHR$(27)"ETHE BEST SCO
RE SO FAR IS "A$
200 FORI=1TO2000:IFKEY$="P"THENCALL&A001
201 NEXTI
205 PLAY0,0,0,0
280 CLS:INK6:PAPER0
285 PRINT" "CHR$(27)"C  PRESS 'P' TO PLA
Y"
287 PRINT
290 PRINT:PRINT:PRINTSPC(10)CHR$(4)CHR$(
27)"J"CHR$(27)"CINSTRUCTIONS"CHR$(4)
300 PRINT:PRINT:PRINT"  YOU ARE IN CONTR
OL OF THE LATEST"
310 PRINT"SUBMARINE SPECIALLY DESINED TO
 SPEND"
320 PRINT"LARGE AMOUNTS OF TIME ON THE S
EA BED."
330 PRINT"  YOUR JOB IS TO DESTROY THE F
LEET OF"
340 PRINT"SHIPS APPROACHING FROM BOTH SI
DES."
345 PRINT
350 PRINT"  YOUR CONTROLS ARE:-"
360 PRINT"CURSOR LEFT  -  MOVE LEFT"
365 PRINT"CURSOR DOWN  -  MOVE RIGHT"
370 PRINT"SPACE BAR    -  LAUNCH TORPEDO"
380 PRINT
390 PRINT"  THE ENEMY"
400 PRINT" "CHR$(27)"D_"CHR$(96)"a
        .....  1"
410 PRINT" "CHR$(27)"E'gh
.....  2"
420 PRINT" "CHR$(27)"Lbc
.....  4"
430 PRINT" "CHR$(27)"Fde
.....  5"
440 FORI=1TO2000:IFKEY$="P"THENCALL&A001
450 NEXT:PLAY0,0,0,0:GOTO90
900 S=&B400+91*8:F=&B400+125*8+7
910 FOR I=S TO F
920 READ J:POKEI,J
930 NEXTI
940 RETURN
1000 DATA 0,0,0,0,15,28,60,60
1010 DATA 12,12,12,30,63,63,63,63
1020 DATA 0,0,0,0,60,38,63,63
1040 DATA 0,0,12,12,12,12,0,0
1050 DATA 0,0,0,0,63,29,15,7
1060 DATA 0,3,3,15,63,45,63,63
1070 DATA 0,0,0,0,63,46,60,56
1080 DATA 0,0,0,3,63,54,63,31
1090 DATA 32,32,32,48,63,54,60,56
1100 DATA 0,3,3,51,51,63,63,63
1110 DATA 0,32,32,63,62,60,54,48
1120 DATA 0,0,0,3,15,63,63,63
1130 DATA 32,32,32,56,63,63,63,63
1140 DATA 0,0,0,0,0,63,63,63
1150 DATA 0,7,7,7,63,29,15,7
1160 DATA 0,0,0,56,63,45,63,63
1170 DATA 0,0,0,0,62,46,60,56
1180 DATA 1,1,1,7,63,29,15,7
1190 DATA 0,0,0,56,63,47,63,62
1200 DATA 3,3,3,63,31,15,7,3
1210 DATA 32,32,32,39,39,63,63,63
1220 DATA 0,0,0,0,0,63,63,63
1230 DATA 1,1,1,7,63,63,63,63
1240 DATA 0,0,0,0,48,63,63,63
1250 DATA 8,41,26,15,60,22,37,4
1260 DATA 0,8,18,13,44,18,4,0
1270 DATA 0,0,0,20,0,20,0,0
1280 DATA 0,6,15,31,31,15,15,7
1290 DATA 0,0,56,60,60,62,60,56
1300 DATA 7,15,15,7,3,0,0,0
1310 DATA 56,60,60,60,48,0,0,0
1320 DATA 0,0,12,12,12,12,18,33
1330 DATA 8,41,26,15,60,22,37,4
1340 DATA 0,8,18,13,44,18,4,0
1350 DATA 0,0,0,20,8,20,0,0
```

# ORIC

I appreciate that typing in this program is no easy task, so I can supply copies of the game on cassette for £3.00 each. Write to M. B. L. Dunlop, 39 Market Street, Buckfastleigh, Devon TQ11 0BA. Please state whether fast or slow mode is required.



THIS GAME RUNS on a 48K Oric-1 and involves attempting to torpedo as many ships as possible before a depth charge finally homes in on the last of a supply of five submarines. There are four different types of enemy each scoring a certain amount of points when hit. Each type also moves at its own speed. Once 15 ships have been destroyed, then providing the player has not been killed in the process, a new attack wave will start together with an increase in difficulty.

The submarine sits on the second to bottom line of the screen and is moved left using cursor left, right using cursor down and a torpedo can be fired using the space-bar.

To enter the program, first type in the Basic program in listing 1. This plays no part in the actual running of the game but merely defines the graphics characters — 36 all together — loads the machine-code, resets the high score, and continually switches between the title screen and the instructions calling the machine code after the start key has been pressed.

After this has been entered, save with:

CSAVE"DESTROYER",AUTO

Next the machine-code must be entered so type New and enter the machine-code loader, listing 2.

The machine-code is listing 3 can now be typed in a byte at a time. Note the hex numbers do not need to be prefixed by a hash character. To break out of the current mode of operation on the loader, simply enter S.

As there is approximately 2½K of machine-code to type in it will require a lot of time and patience, so should you want to save the code so far entered, use

CSAVE"MC",A # A000,E # AA53,AUTO

The game is now complete and will run automatically on

CLOAD "DESTROYER"

# DESTROYER



**Miles Dunlop takes to sea in an attempt to sink the fleet.**

*Listing 2.*

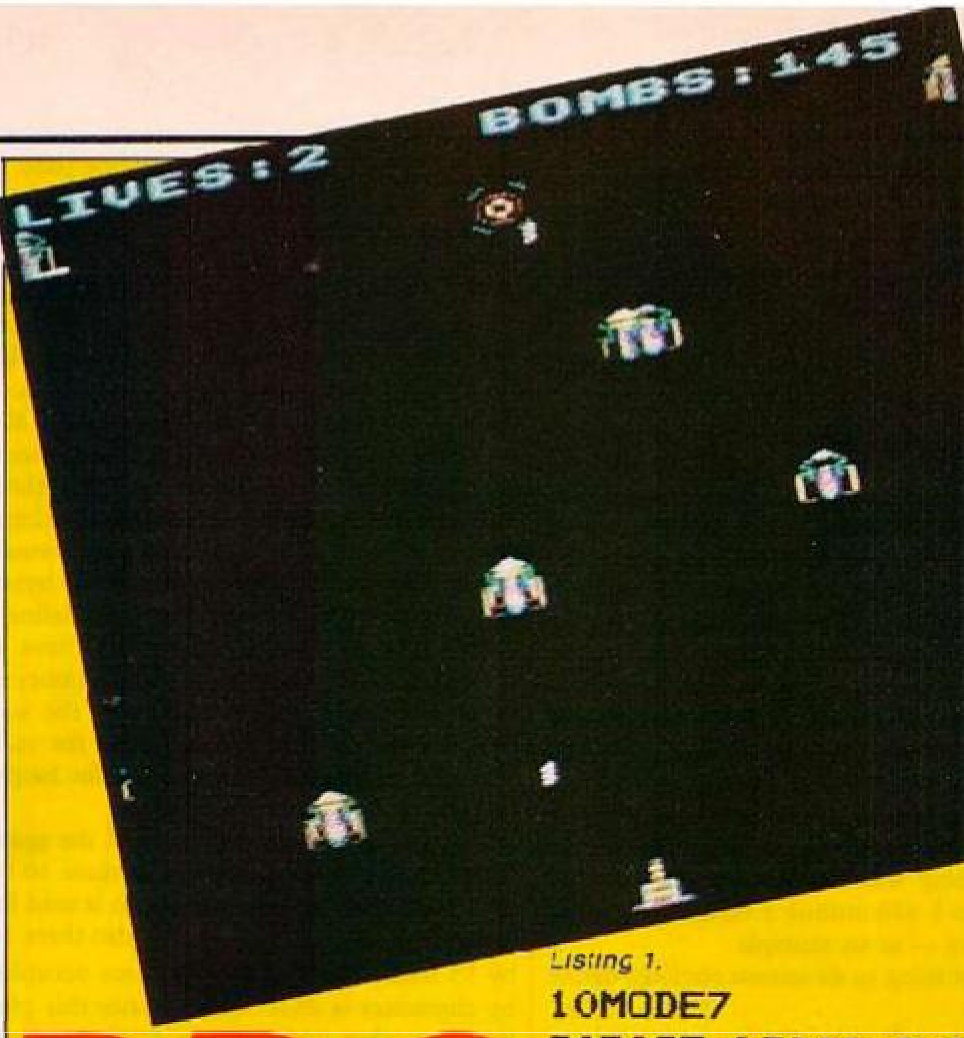
```
0 REM FOR A READ HASH CHARACTER
10 REM ** MACHINE CODE LOADER **
20 CLS
30 PRINT"OPTIONS:-"
40 PRINT"1 - ENTER CODE"
50 PRINT"2 - EXAMINE MEMORY"
60 PRINT"3 - QUIT"
70 INPUT A
80 IF A<1 OR A>3 THEN 70
90 ON A GOTO 100,200,300
100 INPUT"ADDRESS";AD$
110 AD=VAL("&"+AD$)
120 PRINTAD$" : ";
130 INPUT BT$:IFBT$="S"THEN30
140 BT=VAL("&"+BT$)
150 POKEAD,BT
160 AD=AD+1
170 AD$=MID$(HEX$(AD),2)
180 GOTO120
200 INPUT"ADDRESS";AD$
210 AD=VAL("&"+AD$)
215 PRINTAD$" : ";
220 FORI=0TO7
230 BT=PEEK(AD+I)
240 BT$=MID$(HEX$(BT),2)
250 IFBT$=""THENBT$="00"
260 IFLEN(BT$)=1THENBT$="0"+BT$
270 PRINTBT$" ";
280 NEXTI
290 PRINT
295 GETA$:IFA$="E"THEN30ELSEAD=AD+8:AD$=MID$(HEX$(AD),2):GOTO215
300 END
```

*Listing 3.*

```
A000 : 60 A9 01 20 ED A1 A9 00
A008 : A2 05 9D 00 04 CA 10 FA
A010 : A9 01 8D 0C 04 A9 00 8D
A018 : 17 04 A9 0F 8D 0D 04 A9
A020 : 05 8D 0F 04 A9 F0 8D 0E
A028 : 04 20 15 A1 A9 00 A2 03
A030 : A0 00 20 3D A1 A9 01 A2
A038 : 12 A0 00 20 3D A1 A9 02
A040 : A2 1B A0 00 20 3D A1 A2
A048 : 01 A0 00 A9 07 20 A2 A2
A050 : C8 C0 1A D0 F8 A2 00 A0
A058 : 01 A9 16 20 A2 A2 C8 C0
A060 : 0B D0 F8 A2 00 A0 0B A9
A068 : 14 20 A2 A2 C8 C0 1C D0
A070 : F8 A2 00 A0 00 A9 10 20
A078 : A2 A2 8A A2 01 A0 1A 20
A080 : A2 A2 C8 A9 07 20 A2 A2
A088 : A2 06 A0 03 A9 10 20 3D
A090 : A1 A2 0B A0 07 20 3D A1
A098 : A2 10 A0 04 20 3D A1 A2
A0A0 : 17 A0 02 20 3D A1 CA A0
A0A8 : 07 20 3D A1 A2 1D A0 05
A0B0 : 20 3D A1 A2 0C A0 09 A9
A0B8 : 03 20 3D A1 AD 0F 04 18
A0C0 : 69 30 8D 97 BD A2 00 A0
A0C8 : 05 B9 06 04 18 69 30 9D
A0D0 : A0 BB E8 88 E0 06 D0 F1
A0D8 : 20 D1 A2 AD 0C 04 18 69
A0E0 : 30 8D 03 BD AD 17 04 18
A0E8 : 69 30 8D 02 BD A9 12 8D
A0F0 : 13 04 A2 12 A0 1A A9 04
A0F8 : 20 3D A1 A9 00 8D 14 04
A100 : A9 00 8D 12 04 A9 EE 8D
A108 : 10 04 8D 11 04 A9 00 8D
A110 : 18 04 4C 17 A3 A9 80 85
A118 : 40 A9 BB 85 41 A0 00 A9
A120 : 20 91 40 18 A5 40 69 01
A128 : 85 40 A5 41 69 00 85 41
A130 : A5 41 C9 BF D0 E9 A5 40
A138 : C9 E0 D0 E5 60 85 3F 86
A140 : 3E 48 8A 48 98 48 A2 00
A148 : A5 3F C9 10 D0 03 4C D1
A150 : A1 C6 3F 30 08 E8 BD 77
A158 : A1 D0 FA F0 F4 E8 BD 77
A160 : A1 F0 0E 86 3D A6 3E 20
A168 : A2 A2 E6 3E A6 3D 4C 5D
A170 : A1 68 A8 68 AA 68 60 00
A178 : 53 43 4F 52 45 00 53 55
A180 : 42 53 00 48 49 47 48 00
A188 : 10 41 54 54 41 43 4B 20
A190 : 57 41 56 45 20 20 20 20
A198 : 20 16 00 5B 5C 5D 00 02
A1A0 : 5F 60 61 00 03 62 63 00
A1A8 : 06 64 65 00 05 66 67 68
A1B0 : 00 02 69 6A 6B 00 03 6C
A1B8 : 6D 00 06 6E 6F 00 05 70
A1C0 : 71 72 00 01 73 73 73 00
A1C8 : 01 73 73 00 01 75 75 75
A1D0 : 00 A9 76 A6 3E 20 A2 A2
A1D8 : E8 A9 77 20 A2 A2 C8 A9
A1E0 : 79 20 A2 A2 CA A9 78 20
A1E8 : A2 A2 4C 71 A1 85 3F 48
A1F0 : 98 48 8A 48 A9 05 A2 00
A1F8 : A0 01 20 86 A2 A9 01 8D
A200 : E1 02 A9 00 8D E2 02 8D
A208 : E4 02 8D E6 02 8D E8 02
A210 : A9 02 8D E3 02 A9 04 8D
A218 : E5 02 A9 64 8D E7 02 20
A220 : 21 F4 20 6D A2 A5 3F F0
A228 : 05 A2 00 4C 30 A2 A2 18
A230 : 8D EF A2 F0 29 8D E5 02
A238 : A9 04 8D E3 02 A9 01 8D
A240 : E1 02 20 7E A2 20 6D A2
A248 : E8 8D EF A2 A0 00 85 3F
A250 : C8 D0 FD C8 D0 FD C6 3F
A258 : D0 F6 E8 4C 30 A2 A9 01
A260 : A2 00 A0 01 20 86 A2 68
A268 : AA 68 A8 68 60 A9 00 8D
A270 : E2 02 8D E4 02 8D E6 02
A278 : A9 08 8D E7 02 60 8A 48
A280 : 20 24 F4 68 AA 60 8D E1
A288 : 02 48 98 48 8A 48 8E F3
A290 : 02 8C E5 02 A9 00 8D [illegible]
A298 : 02 20 1E F4 68 AA 68 A8
A2A0 : 68 60 85 36 86 37 84 38
A2A8 : 98 48 A9 80 85 39 A9 BB
A2B0 : 8C 3A A4 37 C6 38 30 10
A2B8 : 18 A5 39 69 28 85 39 A5
A2C0 : 3A 69 00 85 3A 4C B4 A2
A2C8 : A5 36 91 39 68 A8 A5 36
A2D0 : 60 4E 9E 48 8A 48 A2 00
A2D8 : A0 05 BD 00 04 18 69 30
A2E0 : 9D 85 BE E8 88 E0 06 D0
A2E8 : F1 68 AA 68 A8 68 60 01
A2F0 : 64 03 32 04 4B 08 46 09
A2F8 : 96 08 28 06 28 04 28 03
A300 : 35 01 7D 01 19 00 00 01
A308 : 23 0C 23 03 23 0A 23 05
A310 : 23 06 23 06 64 00 00 20
A318 : 0A A5 20 C4 A3 20 DB A7
A320 : 20 AF A6 20 55 A7 AD 08
A328 : 02 C9 A5 D0 01 6C EA AE
A330 : 0B 04 A0 0C C8 D0 FD CA
A338 : D0 FA 3E AD 10 04 E9 01
A340 : 8D 10 04 AD 11 04 E9 00
A348 : 8D 11 04 AD 18 04 C9 0F
A350 : D0 C5 CE 0E 04 D0 0A EE
A358 : 0D 04 AE 0E 04 C9 14 90
A360 : 08 A9 03 CE 0E 04 CA D0
A368 : FA A9 0C 20 ED A1 AD 0C
A370 : 04 18 69 01 C9 0A F0 06
A378 : 8D 0C 04 4C BC A3 AD 17
A380 : 04 18 69 01 8D 17 04 A9
A388 : 00 8D 0C 04 AE 18 04 C9
A390 : DD F0 03 CE 18 04 A9 05
A398 : 20 A9 A6 20 A9 A6 4C 29
A3A0 : A0 85 3F 98 48 AE 10 04
A3A8 : 85 3D AD 11 04 85 3E AC
A3B0 : 76 02 C6 3E B1 3C C5 3F
A3B8 : B0 05 E6 A8 A9 0C 60 68
A3C0 : A8 A9 01 6C AE 12 04 D0
A3C8 : 01 60 A5 00 85 40 A0 00
A3D0 : B9 53 AA 85 41 B9 54 AA
A3D8 : 85 42 B9 55 AA 85 43 B9
A3E0 : 56 AA 85 44 B9 57 AA 85
A3E8 : 45 20 1F A4 A5 40 CD 12
A3F0 : 04 F0 2B A5 46 DC 1E A5
A3F8 : 41 99 53 AA A5 42 99 54
A400 : AA A5 43 99 55 AA A5 44
A408 : 99 56 AA A5 45 99 57 AA
A410 : C8 C8 C8 C8 C8 E6 40 A5
A418 : 40 CD 12 04 D0 B2 60 AD
A420 : 10 04 38 E5 43 8C FB 18
A428 : 65 43 FC 01 60 98 48 A9
A430 : 00 85 46 AE 44 A4 45 A5
A438 : 41 20 1C A6 A5 42 D0 15
A440 : E8 E0 25 FC 25 A5 41 20
A448 : 3D A1 20 EA A4 B6 44 20
A450 : A4 A4 68 A8 60 CA E0 01
A458 : F0 10 A5 41 20 3D A1 20
A460 : EA A4 86 44 20 A4 A4 68
A468 : A8 60 A5 40 85 47 68 A8
A470 : 48 98 AA C8 C8 C8 C8 C8
A478 : A9 05 85 48 B9 53 AA 9D
A480 : 53 AA E8 C8 C6 48 D0 F4
A488 : FA 47 A5 47 CD 12 04 D0
A490 : E7 A9 01 85 46 A9 01 A2
A498 : 00 A0 01 20 86 A2 68 A8
A4A0 : CE 12 04 6C A5 41 C9 05
A4A8 : F0 3E C9 06 F0 28 C9 07
A4B0 : F0 1A C9 08 FC 0C C9 09
A4B8 : F0 26 C5 0A F0 18 C9 0B
A4C0 : F0 0A A9 05 A2 0C A0 0A
A4C8 : 20 8D A6 60 A9 00 A2 96
A4D0 : A0 00 20 8C A6 60 A9 01
A4D8 : A2 2C A0 0C 2C 8C A6 60
A4E0 : A9 02 A2 BC AC 0A 20 8D
A4E8 : A6 60 96 4E BA 4E AD 0E
A4F0 : 04 38 E9 05 20 A1 A3 C9
A4F8 : 01 F0 05 6E A4 66 AB 60
A500 : E3 C8 A9 5C 20 A2 A3 4C
A508 : F3 A4 AD 12 04 C9 07 F0
A510 : 0A AD 0E 04 20 A1 A3 C5
A518 : 01 F0 [illegible] 66 AD 10 04 EE
A520 : 10 04 F0 F8 85 50 A5 E6
A528 : 20 A1 A3 C9 01 D0 03 4C
A530 : E3 A5 A9 C8 20 A1 A3 C5
A538 : 01 D0 03 4C F2 A5 A5 AA
A540 : 20 A1 A3 C9 01 D0 03 4C
A548 : F9 A5 A9 82 20 A1 A3 C9
A550 : 01 D0 03 4C 00 A6 A9 64
A558 : 20 A1 A3 C9 C1 D0 03 4C
A560 : 07 A6 A9 46 20 A1 A3 C9
A568 : 01 D0 03 4C 0E A6 A9 28
A570 : 20 A1 A3 C9 01 D0 03 4C
A578 : 15 A6 A9 C5 A2 C2 48 AC
A580 : 10 04 B9 C0 C0 18 6D 76
A588 : 02 4A 4A 4A 4A 4A 18 69
A590 : 0C A8 68 20 3D A1 85 40
A598 : 86 41 84 42 A5 50 8D 10
A5A0 : 04 A0 00 AD 12 04 85 43
A5A8 : C6 43 30 C8 C8 C8 C8 C8
A5B0 : C8 4C A8 A5 EE 12 04 A5
A5B8 : 40 99 53 AA A5 41 99 56
A5C0 : AA A5 42 99 57 AA A6 40
A5C8 : BD 1E A5 99 55 AA E0 09
A5D0 : 30 06 A9 00 99 54 AA 60
A5D8 : A9 01 99 54 AA 60 00 00
A5E0 : 00 00 00 04 02 01 03 04
A5E8 : 02 01 03 A9 CC A2 24 4C
A5F0 : 7E A5 A9 0B A2 24 4C 7E
A5F8 : A5 A9 0A A2 24 4C 7E A5
A600 : A9 09 A2 24 4C 7E A5 A9
A608 : 08 A2 02 4C 7E A5 A9 07
A610 : A2 02 4C 7E A5 A9 C6 A2
A618 : 02 4C 7E A5 65 3F 86 3E
A620 : 48 8A 48 98 48 A2 C0 C6
A628 : 3F 30 08 E8 BD 4D A6 D0
A630 : FA F0 74 E8 BD 4D A6 F0
A638 : 0F AA 3D A6 3F 20 A2 A2
A640 : E6 3E A6 3D 4C 33 A6 68
A648 : A8 58 AA 68 60 00 07 00
A650 : 07 00 07 00 07 00 20 20
A658 : 20 00 20 20 20 20 00 20
A660 : 20 20 00 20 20 20 00 20
A668 : 20 20 20 C0 20 20 20 20
A670 : 00 20 20 20 00 20 20 20
A678 : 00 20 20 20 20 C0 20 20
A680 : 20 20 00 20 20 20 20 C0
A688 : 20 20 20 20 C0 6D E4 02
A690 : 3E E3 02 8C E5 02 48 58
A698 : 48 8A 48 A9 C1 8D E1 02
A6A0 : 20 1E F4 68 AA 68 A8 68
A6A8 : 60 85 46 AD 03 04 E5 47
A6B0 : AD 00 04 18 65 46 C9 CA
A6B8 : 90 77 38 E9 0A 8D C0 C4
A6C0 : AD 01 04 69 00 C9 CA 50
A6C8 : 5E A9 00 8D 01 04 AD C2
A6D0 : 04 69 00 C9 0A 90 66 A9
A6D8 : 00 8D 02 04 AD 03 C4 69
A6E0 : 00 C9 0A 90 5E A9 00 8D
A6E8 : 03 04 AD 04 04 69 C0 C9
A6F0 : 0A 90 36 A9 00 8D 04 04
A6F8 : AD 05 04 69 00 C9 CA 50
A700 : 4E A9 00 8D 05 04 A5 47
A708 : CD 03 04 F0 1E 98 48 8A
A710 : 48 20 C7 FA AE 0F 04 E8
A718 : E0 0A D0 01 CA 8E 0F 04
A720 : 8A 18 69 30 8D 97 BB 68
A728 : AA 60 A8 20 01 A2 A5 46
A730 : 60 8D 00 04 4C 06 A7 8D
A738 : 01 04 4C 06 A7 8D 02 C4
A740 : 4C 06 A7 8D 03 04 4C 06
A748 : A7 8D 04 04 4C 06 A7 8D
A750 : 05 04 4C 06 A7 A9 01 65
A758 : 40 A9 BF 85 41 A0 DF E1
A760 : 40 C9 20 F0 1C C9 5E F0
A768 : 2C C9 73 F0 41 C9 7B F0
A770 : 44 C9 74 F0 47 C9 7C F0
A778 : 4A C9 75 F0 4D C9 7D F0
A780 : 50 A5 41 C9 BD F0 09 68
A788 : C0 FF D0 D3 C6 41 D0 CF
A790 : D0 3A D0 F3 60 A9 20 91
A798 : 40 18 A5 40 69 28 85 40
A7A0 : A9 5E 91 40 38 A5 40 E9
A7A8 : 28 85 40 4C 81 A7 A9 7B
A7B0 : 91 40 4C 81 A7 A9 74 91
A7B8 : 40 4C 81 A7 A9 7C 91 40
A7C0 : 4C 81 A7 A9 75 91 40 4C
A7C8 : 81 A7 A9 7D 91 40 4C 81
A7D0 : A7 A9 20 91 40 4C 81 A7
A7D8 : AE 13 04 A0 1A A9 04 20
A7E0 : 0C AA C9 00 F0 57 AD 08
A7E8 : 02 C9 38 D0 01 60 AE 13
A7F0 : 04 A0 1A A9 04 20 1C A6
A7F8 : AD 08 02 C9 AC F0 0E C9
A800 : B4 F0 16 C9 84 F0 1B A9
A808 : 04 20 3D A1 60 CA E0 01
A810 : D0 01 E8 8E 13 04 4C 07
A818 : A8 E8 E0 25 D0 F5 CA 4C
A820 : 13 A8 AD 14 04 D0 E0 E8
A828 : 8E 15 04 88 8C 16 04 A9
A830 : 7A 20 A2 A2 A9 01 8D 14
A838 : 04 CA C8 D0 CA 20 9B FA
A840 : A2 0C A0 00 C8 D0 FD E8
A848 : D0 FA A2 00 A0 00 C8 D0
A850 : FD E8 D0 FA A9 03 A2 00
A858 : A0 01 20 86 A2 AE 13 04
A860 : A0 1A A9 04 20 1C A6 CE
A868 : 0F 04 F0 0A A9 01 20 ED
A870 : A1 68 68 4C 29 A0 A2 00
A878 : BD A3 A8 9D 95 BD E8 E0
A880 : 0C D0 F5 A2 05 BD 06 04
A888 : DD 0C 04 90 08 D0 03 CA
A890 : D0 F3 68 68 60 A2 05 BD
A898 : 0C 04 9D 06 04 CA 10 F7
A8A0 : 66 66 6C 07 0C 47 41 4D
A8A8 : 45 20 4F 56 45 52 08 AD
A8B0 : 14 04 D0 01 60 AE 15 04
A8B8 : AC 16 04 A9 20 20 A2 A2
A8C0 : 88 C0 0F D0 03 4C D0 A9
A8C8 : 20 DF A9 C9 21 B0 03 4C
A8D0 : 24 A9 86 40 84 41 A9 00
A8D8 : 85 42 AC 12 04 D0 03 4C
A8E0 : 24 A9 AC 0C B9 53 AA 85
A8E8 : 43 B9 56 AA 85 44 B9 57
A8F0 : AA 85 45 84 46 A6 44 A4
A8F8 : 45 A5 43 20 3E A1 A6 40
A900 : A4 41 A9 76 20 A2 A2 A6
A908 : 44 A4 45 A5 43 20 0C AA
A910 : C9 00 F0 26 A4 46 C8 C8
A918 : C8 C8 C6 E6 42 A5 42 CD
A920 : 12 04 D0 C0 CF 16 04 AE
A928 : 15 04 AC 16 04 A9 7A 20
A930 : A2 A2 98 A4 A9 05 AC 0A
A938 : 20 86 A2 6C EE 18 04 A5
A940 : 43 C9 05 F0 14 C9 08 F0
A948 : 10 C9 09 F0 0C C9 0C F0
A950 : 08 A9 0E 20 3D A1 4C 5E
A958 : A9 A9 0E 20 3D A1 A5 42
A960 : 85 48 A6 46 A4 46 C8 C8
A968 : C8 C8 C6 A9 05 85 47 B9
A970 : 53 AA 9D 53 AA E8 C8 C6
A978 : 47 D0 F4 E6 48 A5 48 CD
A980 : 12 04 D0 E7 A9 01 A2 00
A988 : A0 01 20 86 A2 A9 05 A2
A990 : 00 A0 01 20 86 A2 CE 12
A998 : 04 A9 00 8D 14 04 A5 43
A9A0 : C9 05 F0 1A C9 09 F0 16
A9A8 : C9 06 F0 18 C9 0A F0 14
A9B0 : C9 07 F0 16 C9 0B F0 12
A9B8 : A9 02 20 A9 A6 60 A5 01
A9C0 : 20 A9 A6 60 A9 04 20 A9
A9C8 : A6 60 A9 06 20 A9 A6 60
A9D0 : A9 00 8D 14 04 A9 05 A2
A9D8 : 00 A0 01 20 86 A2 60 8A
A9E0 : 37 84 38 98 48 A9 BB 85
A9E8 : 3A A9 8C 85 39 A4 37 C6
A9F0 : 38 30 10 16 A5 39 69 28
A9F8 : 85 39 A5 3A 69 00 85 3A
AA00 : 4C EF A9 B1 39 85 36 68
AA08 : A8 A5 36 6C 85 3F 86 3E
AA10 : 8A 48 98 48 A2 0C C6 3F
AA18 : 30 08 EE BD 77 A1 D0 FA
AA20 : F0 F4 E6 BD 77 A1 F0 18
AA28 : C9 [illegible] 90 22 86 3E A6 3E
AA30 : 85 3C 20 DF A9 C5 3C D0
AA38 : 0E E6 3E A6 3D 4C 22 AA
AA40 : 68 A8 68 AA A9 01 60 68
AA48 : A8 68 AA A9 00 60 86 3D
AA50 : 4C 39 AA 05 00 04 0E 13
```

# BBC SPRITES

Bobby Rao explains the game using his sprites routine which was promised last month.




*Listing 1.*

```
10MODE7
20PAGE=&2000:CHAIN""
```

LAST MONTH I showed you how to define characters for the sprites routine and this month I will show you how to use them in your own Basic programs. But first a few explanatory notes on topics mentioned last month.

To achieve animation a sequence of slightly different characters needs to be displayed. To define these sorts of characters I would advise first defining a Basic character and Saving it uncompiled and then reloading it — more than once if necessary — so that each stage of the animation may be defined simultaneously, swapping between characters to simulate the animation. Then when all the characters are ready they may be Saved one after the other.

The string of addresses which you enter at the end of a sprite's attributes go to make up the sprite's normal and termination sequences of animation. The characters at the given addresses are displayed in order, repeatedly. To obtain an effect like a pendulum swinging then, although only three distinct characters are required — the pendulum to the right, to the left and at the centre — the characters must be displayed in the order centre, right, centre, left. Thus four frames of animation are required here and the character addresses must be entered in this order. This method applies to many types of animation so please note it carefully or you will end up with jerky animation.

## Sprite magnification

When using the magnification facility note that as the sprite grows or shrinks its centre remains stationary or moves with the speed defined for the character.

Hit colours — I explained the easiest way to use these last month but if you understand how colours of pixels are stored in bytes by Mode 2 then let me say that each byte altered by printing a character is "Anded" with the hit colour byte for that sprite and if the result is not zero a hit is registered.

Printing — When you have the sprites routine in memory then by loading the code produced by CHARPRT. To print a sprite character in memory onto the screen xLOAD the sprites routine and "PRT CODE". This latter Loads into $C00 to $C1F so the first fouruser definable characters are unusable. To print a character at $1300 in memory at $20 along the X axis and $80 down the Y axis use the following in Mode 2:

```
&74 = &13008020
CALL &LC00
```

The character should now appear and to remove it use the same commands. Note that you can print onto the screen at any time while sprites are in motion and they will move without corrupting the background.

After you have defined and Saved the code of the sprites using the sprites' generation program you may use this code by first setting PAGE to &2000, typing New and then *LOADing the code. To start the sprites first go into Mode 2 and then use the following lines of Basic:

```
?&8D = 0 : ?&8F = 0 : ?&D3E = no. of
sprites : ?&D3F = 0 : ?&8E = 1
?&FE6E = &1F : ?&FE6D = &E0 :
?&FE6E = &E0
?&FE6B = (?&FE6B) AND &BF
?&FE68 = 0 : ?&FE69 = 30
?&206 = &4F : ?&207 = &12
```

To stop the sprites use

```
?&FE6E = (?&FE6E) AND 127
```

To make the sprites move more slowly put a larger value in &8E — 1 is fast and 256 is slow. Location &D3F contains the number of dead sprites and is updated each time a sprite dies, that is, finishes its termination sequence and disappears.

To see at any time if a sprite number N is dead use

?(&D40 + (4xN))

which will return a value greater than 128 if the sprite is dead.

Page &D is used by the routine and for every sprite there are four bytes which hold data about where the sprite's attributes are.

The first byte of the four holds the length of the sprite's attributes. Also 128 is added to this number if the sprite is dead.

The second and third bytes hold the address of the sprite's attributes — low byte followed by high byte.

The fourth byte of the four contains the number of the frame currently being displayed — initially this contains.

(continued on next page)

*Listing 2.*

```
10MODE7
20PRINTTAB(11,2);"_________________"
30PRINTTAB(10,3);CHR$141;"Sprites Game One"
40PRINTTAB(10,4);CHR$141;"Sprites Game One"
50PRINTTAB(11,5);"_________________"
60PRINT''"As you sit poised at your photon mega  bl
aster you can just see the menacing  undulations of yo
ur foe approaching    and your mind reels at the enorm
ity of your task...etc."
70PRINTTAB(11,15);"Z-LEFT    X-RIGHT"
80PRINTTAB(6,17);"SHIFT-THRUST    RETURN-FIRE"
90PRINTTAB(8,19);"SPACE BAR - HYPERSPACE"
100VDU28,11,24,28,21
110*LOAD
120*LOAD
130CHAIN""
```

*(continued from previous page)*

The first of these groups of four bytes is at &D40 because the memory from &D00 to &D3D is used to hold a copy of the attributes of the sprite the routine is working on. This is the limiting factor in how many frames of animation one sprite can have, that is, its attributes must fit into &D00 to &D3D.

To alter any of the sprites' attributes you must first find out where in memory they are stored. The "next free address" stated after loading in character data for the sprite defining is where sprites' attributes start. The length of this data for a particular sprite is given by 20 plus twice the number of frames of animation used in normal movement and in the termination sequence. So for a sprite with four normal frames and three termination frames the total length of its data is 20+2x (4+3)=34.

Although this is all you really need to know to be able to write a game using the sprites you probably still have no idea how to go about it so I will outline a Galaxians-type — with listing — as an example.

The first thing to do sounds obvious: define the game.

My game will consist of several levels of various types of aliens each type moving in a different manner and each member of a level moving independently of each other. The player will be represented by a ship at the bottom of the screen which may fire single bullets upwards, move left or right and thrust upwards, being pulled down again by an unknown force.

With the sprites routine in position and Page set to &2000 there is 4K for a Basic program and 3¼K for sprites characters and attributes. I thought that at least four frames of animation would be required for good effects so with a three frame explosion the attributes for a sprite would be 34 bytes long. Also I thought that seven aliens would be adequate for each sheet and this together with the player's ship, its bomb and three bombs for the aliens means that at any one time 12 sprites may be active.

Thus, as the attributes for a bomb are 24 bytes long the attributes can take up (7×34) + (1×34) + (3×24) + (1×24) = 368 bytes. However if on one of the levels the aliens have more than three frames of animation this number will increase by 14 per extra frame, so be on the safe side we may assume that 400 bytes are needed for sprites' attributes. I want eight levels of aliens and if each has three characters of 10 by 15 pixels for its normal frames of animation these characters would occupy 8×3× (10×15/2+2) = 1968 bytes. This figure arises because when you define a character of 10 by 15 pixels and Save it compiled, it only takes up half the number of bytes you would expect because of the way Mode 2 stores pixel colours. Also for each character you must add two bytes for height and width.

To this figure we must also add the space taken up by the ship, which is of three 10 by 15 frames, and the explosion which is used for both aliens and the ship; this is also three 10 by 15 frames. Thus the total space occupied by characters is 2430 bytes. Hence this plus the room taken up by sprites' attributes gives about 2800 bytes used leaving about 500 bytes free for more frames in certain levels or some larger characters.

Now we have defined our game we can concentrate on the fun part: defining the characters. You can do what you like here and if you feel particularly artistic try to make the levels have more than four frames of animation. However, there are a few things to note: try to fit the characters for each level into about 300 bytes per level and do not forget to leave room for your ship and an explosion — three frames.

The explosion will be the same for all the aliens on all levels and also for your ship so try to make all these characters about the same size because it looks odd when a tall, thin alien has a square explosion half its height. When defining a bomb a simple 6 by 2 block is sufficient and if you are lazy you can use the same character for both the aliens' and your ship's bombs. The bombs will have no explosion and will disappear on hitting something.

Also define your bomb using only flashing colours because we will later define aliens so that they only crash into flashing colours — just passing through the other colours. Do not use flashing colours for any other characters. After you have defined and Saved — compiled — the characters you need set Page to &2000, type New and Load in the Basic part of the sprites defining program listed last month. Run this program and Load in all your character data.

I advise you to make a list of the characters you Load in and their corresponding addresses in memory as told to you by the program. I include part of the list I made so you can see how it is used in the game listing given later.

| *FILENAME* | *ADDRESSES OF SUCCESSIVE FRAMES (IN DECIMAL)* |
|---|---|
| Rocket | 4864,4941,5018 |
| Skull | 5095,5172,5249 |
| Wobbler | 5326,5403,5480 |
| — 6 more alien types | |
| Explosion | 6788,6865,6942 |
| Ship | 7019,7096,7173 |
| Alien missile | 7250 |
| Ship's bomb | 7258 |
| Next free address is | 7266 |

When you have finished you will be told the next free address after the character data in decimal. Convert this number to hex (as detailed on pages 410 and 411 of the User Guide) — let us call it WXYZ — and use it in the following command:

xSAVE"chardata" 1300 WXYZ

This will Save the character data all in one go for use with the actual game program. We do not need to use the rest of the sprites defining program because many of its

*(continued on page 120)*

*Listing 3.*

```
10ENVELOPE1,129,-20,-15,-10,10,10,10,126,0,0,-126,126,126
20MODE2
30COLOUR3:PRINTTAB(2,30);"Space bar to play"
40REPEAT:G=GET:UNTILG=32
50MODE2:COLOUR6:PRINTTAB(0,0)"LIVES:";TAB(10,0)"BOMBS:"
60DATA0,0,0,0,4,3,150,0,1,1,1,1,0,0,1,1,192,195,0,0,4864,4941,5018,4941,6788,6865,6942
70DATA40,0,240,0,4,3,150,0,1,1,1,1,0,10,0,0,255,140,0,0,7019,7096,7173,7096,6788,6865,6942
80DATA0,0,237,-6,1,1,150,0,1,1,1,1,0,15,0,0,255,129,0,0,7258,7258
90DATA0,0,0,6,1,1,150,0,1,1,1,1,0,15,0,0,0,129,0,0,7250,7250
100DATA100
110ST%=7363:S%=ST%:D%=0
120ALN%=7:ALNB%=3:FLT%=8
130FRM%=4:TFRM%=3:TDUR%=72
140SFRM%=4:STFRM%=3:STDUR%=12
150ATL%=20+2*FRM%+2*TFRM%
160SATL%=20+2*SFRM%+2*STFRM%
170MATL%=20+2*1+2*1
180SHP%=ST%+ALN%*ATL%:SHPD%=&D40+ALN%*4
190BMB%=SHP%+SATL%:BMBD%=SHPD%+4
200MIS%=BMB%+MATL%:MISD%=BMBD%+4
210FORM%=1 TOALN%:PROCINIT(0):NEXT
220PROCINIT(1):PROCINIT(2)
230FORM%=0 TOALNB%:PROCINIT(3):NEXT
240?&D3E=D%
250G%=4:E%=150:L%=0:H%=0
260PROCRESET
270PROCSTART
280PRINTTAB(16,0);E%
290FORA%=0 TOG%
300PRINTTAB(6,0);G%-A%
310REPEAT:IF?(SHP%+17)<128 SOUND&10,-15,5,3:GOTO370
320IFINKEY(-98) ?(SHP%+1)=-1 ELSEIFINKEY(-67) ?(SHP%+1)=1
330IFINKEY(-1) AND?(SHP%+2)>30 ?(SHP%+3)=-3 ELSE?(SHP%+3)=1
340IFINKEY(-74) AND?BMBD%>128 AND?(SHP%+2)>20 ?BMB%=?SHP%+2:?(BMB%+2)=?(SHP%+2)-10:?(BMB%+3)=-6:?(BMB%+17)=129:?(BMB%+6)=150:?&D3F=?&D3F-1:?BMBD%=MATL%:E%=E%-1:PRINTTAB(16,0);E%;" "
350IFINKEY(-99) ?SHP%=RND(79):?(SHP%+2)=100+RND(140)
360PROCBOMB(RND(3)-1,RND(7)-1)
370UNTIL(?&D3F=7 AND?(SHP%-17)>127) OR?SHPD%>128 ORE%<1
380IFE%<1 GOTO420
390IF?&D3F=7 AND?SHPD%<128 PROCRESET:?&D3F=0:GOTO310
400?(SHP%+6)=150:?(SHP%+17)=128+STDUR%:?SHPD%=ATL%:?&D3F=?&D3F-1
410NEXTA%
420PROCFIN
430GOTO30
440DEFPROCBOMB(A%,B%)
450IF?(ST%+17+B%*ATL%)<128 OR?(MISD%+A%*4)<128 ENDPROC
460?(MIS%+A%*MATL%)=?(ST%+B%*ATL%)+2:?(MIS%+2+A%*MATL%)=?(ST%+2+B%*ATL%)+15
470?(MIS%+3+A%*MATL%)=6
480?(MIS%+A%*MATL%+17)=129:?(MIS%+A%*MATL%+6)=150:?(MISD%+A%*4)=MATL%
490?&D3F=?&D3F-1
500ENDPROC
510DEFPROCRESET
```

*(listing 3 continued on page 120)*

*(continued from page 118)*
functions will be duplicated and used repeatedly in the game program so do not enter Data lines as the program asks.

Now type in and Save one after the other listings 1 and 2. These Load the character data, the sprites routine and the game program. Make a copy of the character data and the sprites routine — listed last month — after listings 1 and 2.

You must type it in as it is printed and will have to adjust it to fit your graphics which are, of course, different from mine.

Here are a few points to note about the data lines — 60 to 100.

All the sprites are normal size. Note that the aliens can crash into flashing colours only, so as long as only your bomb is of flashing colours they will only crash on hitting that. Your ship stops on hitting any edge of the screen. Also your ship will explode on hitting any colour — so the program cannot let you go faster than your bomb or you may hit it. Your ship always starts off at 40 along the X axis and 237 down the Y axis. Your bomb has an upward speed of six pixels per frame and does not move sideways — these are not changed by the program. Also this sprite will terminate on hitting an edge or on hitting any colour.

The aliens' missiles move down at six pixels per frame and do not move sideways. They also terminate on hitting any edge or on hitting any colour. Line 100 is just to tell the program data ends here.

Type in these lines but make the following changes: the fifth number in each line should be changed to the number of frames of animation you have for that sprite type, the sixth number should be changed to the number of frames of termination animation, the eighteenth number should be changed to 128 plus how long you want the termination sequence to go on and the last few numbers which are addresses for characters making up the sprite and its termination sequence should be changed to suit your graphics. For the aliens' line insert addresses for the first type of alien — these will be altered by the program to suit each level. Lines 110 to 200 are used to set up system variables which are listed below.

- **ST%** — This the start of the sprites' attributes
- **FLT%** — The number of fleets (levels) of aliens
- **ALN%** — How many aliens there are per fleet
- **ALNB%** — The max. number of alien bombs on the screen simultaneously
- **FRM%** — The no. of frames of animation of the aliens (must be same as in line 60 data statement)
- **TFRM%** — The number of frames of animation of the aliens (must be same as in line 60 data statement)
- **TDUR%** — Length of aliens' termination sequence
- **SFRM%** — Number of frames of animation for your ship (must be same as in line 70)
- **STFRM%** — Number of frames of termination sequence for ship (must be same as in line 70)
- **ATL%** — This is the length of the attributes for each alien sprite.
- **SATL%** — The length of attributes for the ship. This is also calculated as above
- **MATL%** — The length of attributes for the ship's bomb and for the aliens' missiles. This is not calculated and assumes a sprite with only one frame of animation that disappears on hitting something
- **SHP%** — The address of the ship's attributes.
- **SHPD%** — The address of the ship's data in PAGE &D
- **BMB%** — The address of the ship's bomb's attributes
- **BMBD%** — The address of the ship's bomb's data in PAGE &D
- **MIS%** — The address of the first sprite that is an alien bomb
- **MISD%** — The address of the first sprite that is an alien bomb's data in PAGE &D

All the last five variables are calculated and change with other relevant variables. Lines 210 to 230 call PROCINIT repeatedly so I will now explain this procedure. Lines 850 to 920 are PROCINIT. This is a procedure which will you must have in any program you write with sprites as it stores the sprites attributes and data in &D page in the correct place.

Line 250 sets some more variables:
G% is the number of goes you have (lives)
E% is the number of bombs you start with
L% is the level you are on
H% is how many times you have completed all the levels.

Line 260 calls Procreset which is at lines 510 to 610.

Proclevel sets the characters which make up the aliens' sprites, sets their speeds and their actions on hitting a screen edge for each level of alien. It obtains this information from lines 1100 onwards. These Data lines — one for each level of aliens with line 1100 corresponding to the first level — contain first the addresses of the characters which make up that alien in the order you want them displayed.

The next two numbers control the sprites' speed in the X and Y axes respectively. If the speeds are entered then each alien has that speed but if 128 is added to the speed then each alien has a randomly chosen speed up to the speed entered. The next number is bounce control — see last month's article. The last two numbers are random displacement controls and say how much random speed the sprites should have — see last month's article. All the parameters reset by Procreset and Proclevel should be reset each time you wish to reincarnate or initiate a sprite.

Line 260 then calls Procstart — lines 930 to 1000 — and this initiates the interrupts

*(listing 3 continued from page 118)*

```
520LOCALN%
530?&D3F=0
540FORN%=0 TOALN%-1
550?(ST%+N%*ATL%)=RND(10)+N%*10:?(ST%+2+N%*ATL%)=RND
(100)
560?(ST%+6+N%*ATL%)=150
570?(ST%+17+N%*ATL%)=128+TDUR%
580NEXT
590PROCLEVEL
600FORN%=0 TOALN%-1:?(&D40+N%*4)=ATL%:?(&D43+N%*4)=1
:NEXT
610ENDPROC
620DEFPROCLEVEL
630LOCALA%,B%,N%,M%
640FORN%=0 TOALN%-1
650RESTORE(1100+L%*10)
660FORM%=0 TOFRM%-1:READA%
670?(ST%+20+M%*2+N%*ATL%)=A% MOD256:?(ST%+21+M%*2+N%
*ATL%)=A% DIV256
680NEXT
690READA%,B%
700REPEAT
710?(ST%+1+N%*ATL%)=FNDISP(A%)
720?(ST%+3+N%*ATL%)=FNDISP(B%)
730UNTIL?(ST%+1+N%*ATL%)<>0 OR?(ST%+3+N%*ATL%)<>0
740READA%:?(ST%+13+N%*ATL%)=A%
750READA%,B%
760?(ST%+14+N%*ATL%)=A%:?(ST%+15+N%*ATL%)=B%
770NEXT
780L%=L%+1:IFL%=FLT% L%=0:H%=H%+1
790E%=E%-H%*20:IFE%<70 E%=70
800ENDPROC
810DEFFNDISP(P%)
820P%=P%+2*H%
830IFP%<128 =P%
840P%=P%-128:=RND(P%)-P%/2
850DEFPROCINIT(C%)
860LOCALN%,B%
870RESTORE(60+C%*10):?(&D41+D%*4)=S% MOD256:?(&D42+D
%*4)=S% DIV256:B%=S%
880FORN%=0 TO19:READA%:?(S%+N%)=A%:NEXT:S%=S%+N%
890READA%:IF A%<256 GOTO910
900?S%=A% MOD256:S%?1=A% DIV256:S%=S%+2:GOTO890
910?(&D40+D%*4)=S%-B%:?(&D43+D%*4)=1:D%=D%+1
920ENDPROC
930DEFPROCSTART
940?&8A=1:?&8D=1:?&8F=0:?&8E=1
950?&D3E=ALN%+1+1+ALNB%:?BMBD%=128+MATL%:FORN%=0 TOA
LNB%-1:?(MISD%+N%*4)=128+MATL%:NEXT
960?&FE6E=&1F:?&FE6D=&E0:?&FE6E=&E0
970?&FE6B=(?&FE6B)AND&EF
980?&FE68=0:?&FE69=30
990?&206=&4F:?&207=&12
1000ENDPROC
1010DEFPROCFIN
1020?&FE6E=?&FE6E AND127:*FX15,1
1030CLS
1040IFE%<1 COLOUR6:PRINTTAB(4,5);"Out of bombs!"
1050COLOUR8
1060PRINTTAB(5,14);"Game Over"
1070COLOUR5
1080PRINTTAB(3,20);"Level ";L%+H%*FLT%;" reached"
1090ENDPROC
1100DATA4864,4941,5018,4941,134,134,0,0.0
1110DATA5095,5172,5249,5172,134,134,5,0.0
1120DATA5326,5403,5480,5403,130,140,5,0.0
1130DATA5615,5557,5673,5557,134,131,0,0.0
1140DATA5812,5735,5889,5735,136,136,5,0.0
1150DATA6038,5961,6115,5961,138,138,4,0.0
1160DATA6192,6269,6346,6423,132,132,5,0.0
1170DATA6500,6572,6644,6716,138,138,0,3.3
```


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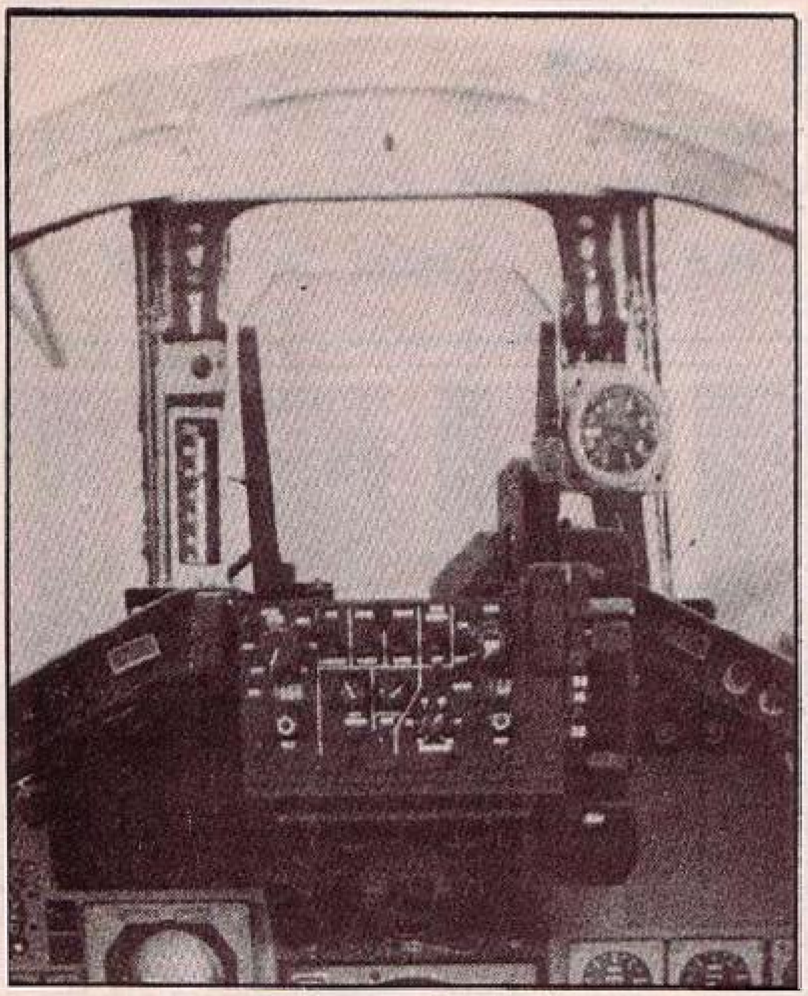
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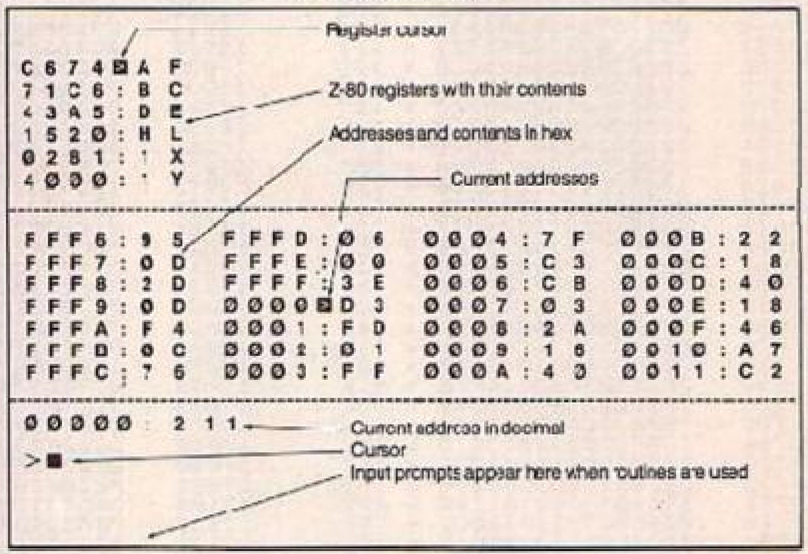
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YC 784



# HEAD-UP DISPLAY

Figure 1: Layout of display




ZX PANEL is a program for the 16K ZX-81 providing a front panel display similar to those found on Research Machines and Memotech computers. It provides a means of easily entering and debugging machine code programs.

ZX Panel is initially stored in a Rem statement for the purpose of saving it, but relocates itself above RAMtop upon loading. The Rem statement is of length 1099 bytes; this can be entered in the following way; enter

1 REM @@100 CHR$ @@

Edit this line, changing the line number to 2, and adding an extra five characters after the Rem. Edit line two eight times to create lines 3 to 10 all of the same length. Then type in the following statements directly, do not attempt to list the program automatically by pressing new line, as this will crash the computer.

```
POKE 16511,77
POKE 16512,4
POKE 16514,118
POKE 16515,118
POKE 16510,0
```

Then enter program 1, the hex loader. Run this program and enter the hex codes — program 2 — in the normal fashion. When the last code has been entered the hex loader will stop. Now delete the hex loader, and enter program 3. Type RUN, and the program will be saved on cassette. When the save is completed press E and ZX Panel will locate above RAMtop, which will be set to 28672, and execute New. . . . Now enter

RAND USR 29126

and the display should appear as in figure 1. If the computer crashes at this point, or any other during the testing, reset the computer and reload the program from tape. When the message appears on the screen after loading, press Break and enter program 4, the hex checker. Run the program and check the codes displayed against those in program 2. If any discrepancies are found, correct them with a direct Poke statement.

*Program 1.*

```
 99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GO TO 150
310 NEXT N
```

If all is well so far, we will now explore the program. The hex address near the centre of the screen indicated by the Sinclair program cursor is called the current address. Code can be entered at the current address by merely typing in one, or a string of up to 15 two-digit hex numbers. The panel provides eight routines, which are accessed by typing full-stop followed by the number of the routine required, followed by Newline. Various parameters are then requested for that routine. The routines are as follows:

**ROUTINE 0:** This is a routine to change the current address. To change the current address to an address where we can enter code enter ".0 Newline", and in response to the prompt "START?" Enter 7436, followed by Newline. All inputs are in hex, so only key presses from full-stop to F will be acknowledged, though Rubout can be used as normal, Newline will increment the current address by 1, cursor up (shifted 7) will decrement the current address by 1. Enter a short program at this address, e.g.,

3E0106FFD710FDC9 Newline

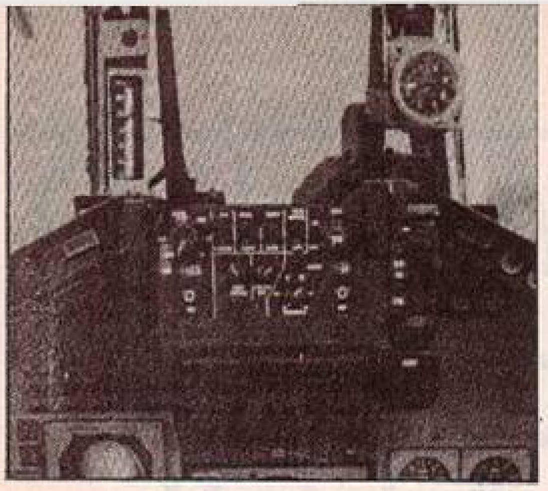
**ROUTINE 1:** This moves a block of code. There are three parameters to be entered, Start and First are the first and last addresses of the block to be moved, To is the address the block will be moved to. To test this routine enter ".1 Newline" and enter 7436,743D and 7437 respectively in response to the prompts. The program you entered should now have moved forward 1 byte. To move it back again enter 7437,743E and 7436 in response to Start, Finish and To. Code can also be moved larger distances, e.g. from Rem to above RAMtop.

**ROUTINE 2:** This runs a machine code subroutine. The registers AF, BC, DE, HL, IX and IY take the values indicated in the top left corner of the display before starting the subroutine — these can be altered (see Routine 7) and on returning from the subroutine, the values of the registers as they were at the end will be displayed.

When the subroutine has finished, a key must be pressed to return to the panel display. To run the program we entered, enter ".2 Newline", and 7436 in response to the prompt. The screen will clear and a series of blocks will be displayed, press any key to return to the panel display. Breakpoints may also be set using Routine 4.

**ROUTINE 3:** This fills a block of memory with a constant. There are three parameters, Start and Finish are the first and last addresses of the block to be filled, With defines the constant. The constant is an 8-bit — 2 digit — hex number, though it must be entered as four digits, e.g. to fill a block from 7438 to 7440 with FF, enter 7438, 7440 and 00FF in response to Start, Finish and To.

**ROUTINE 4:** This sets a breakpoint at the address specified. When your machine code subroutine reaches a breakpoint, it will jump back to the panel display, showing the values of the Z-80 registers at that point in your sub-



```
10 SAVE "PANEL"
15 PRINT "ZX-PANEL LOADED...",
,;TAB 0;"PRESS ""E"" TO CONTINUE
",,;TAB 0;"RAND USR 29126 TO ENT
ER PANEL"
20 IF INKEY$="" THEN GOTO 20
25 RAND USR 16516
```

```
16514 : 7676E19740110070 = 513
16522 : 013604EDB03E7032 = 596
16530 : 0540CDC3032E3E2E = 526
16538 : 3D2D31222A272826 = 355
16546 : 2B27372A26303534 = 370
16554 : 2E33393339263739 = 417
16562 : 2B2E332E362D3C2E = 393
16570 : 392D39313B26313A = 415
16578 : 2A00000000000000 = 42
16586 : 0000000000010000 = 1
16594 : 0000000000000000 = 0
16602 : 0000C5D52A0C4023 = 563
16610 : 1600591911210004 = 190
16618 : 0528031310FDD1C1 = 744
16626 : 220E40C878E6F01F = 934
16634 : 1F1F1FC51CD778E6 = 884
16642 : 0FC51CD7C9C544CD = 1127
16650 : 5F7045CD5F703E0E = 764
16658 : D7C1C92A2C7011FC = 1070
16666 : FF190E000608E5CD = 742
16674 : 4570E1CD7070C546 = 1102
16682 : CD5F7023C10478FE = 1018
16690 : 0F20EB3E08814FFE = 914
16698 : 2020E0010C0BCD45 = 586
16706 : 703692CDDE70C93E = 1114
16714 : 1CA7ED5238033C18 = 557
16722 : F00719001110270D = 967
16730 : 827011E303CDB270 = 1037
16738 : 118420CDB270110A = 539
16746 : 00CDE270110100CD = 718
16754 : 8270C9010010CD45 = 782
16762 : 703E12D72A2C70E5 = 834
16770 : CD8F703E0ED7E17E = 1150
16778 : 2600EFCDCB70C9FD = 1123
16786 : 224370DD22417022 = 679
16794 : 3F70ED533D70ED43 = 972
16802 : 3B70E5F5E1223970 = 1073
16810 : E1C92A3970E5F1ED = 1344
16818 : 4B3B70ED5B3D702A = 789
16826 : 3F70CD2A4170FD2A = 910
16834 : 4370C9CDFA70F5C5 = 1339
16842 : D5E5DDE5FDE51100 = 1391
16850 : 7001000ACD4570F1 = 730
16858 : CD70701AD7131AD7 = 930
16866 : 1310F1ED4B387041 = 821
16874 : 0ED4CD45703692C9 = 305
16882 : 2A38702D20022E05 = 341
16890 : 223870CD1571C3C5 = 934
16898 : 7100002A0C40CE02 = 247
16906 : 11E8001906203613 = 388
16914 : 2310FB0D20F5C923 = 835
16922 : 0C4011530219E503 = 438
16930 : 06237EFE76200410 = 591
16938 : F81804380018F2E1 = 821
16946 : 361223C9D5C5E523 = 989
16954 : 25402C20FAED4B25 = 776
16962 : 40311420F8CDED07 = 854
16970 : 7EE1C1D1C97ED613 = 1322
16978 : 1717171747237ED5 = 538
16986 : 1C80C9CD2E71CD6E = 1035
16994 : 71CD7E70CD627135 = 1058
17002 : 80CD9F71FE76CA1E = 1209
17010 : 72FE77200B360023 = 527
17018 : 7EFE1220EA2318E7 = 954
17026 : FE702010FE71CA03 = 1030
17034 : 71FE1B38DCFE2C30 = 1016
17042 : D877237EFE7628DF = 1131
17050 : 18CDE52A2C702B22 = 733
17058 : 2C70CD7E70E1CDD2 = 1229
17066 : 712A2C7023222C70 = 535
17074 : C3CC712A0C401154 = 731
17082 : 0219E53A2E70FE0F = 741
17090 : 28237EFE00CA1472 = 919
17098 : FE1B200A237EFE8D = 866
17106 : CAD271C38B72237E = 1134
17114 : FE30CAD271237EFE = 1322
17122 : 8020F31813110402 = 457
17130 : 197EFE80280AE17E = 934
17138 : FE30CAD2712318F7 = 1213
17146 : E13A2E70FE0F2813 = 772
17154 : CD8871E52A2C7077 = 1048
17162 : 23222C70E1237EFE = 865
17170 : 80CACC7118EACDB3 = 1294
17178 : 715723CD88715FC3 = 1033
17186 : C61A17210F722323 = 665
17194 : 20FC7E329F72237E = 894
17202 : 32A072C30000CF71 = 839
17210 : 037300735273 6E73 = 568
17218 : 9173CA7317741971 = 858
17226 : CF71CF71CF71CF71 = 1280
17234 : CF71CF71CF71CF71 = 1280
17242 : C5D5CD8271D1C1E5 = 1439
17250 : C5D5010015CD4570 = 818
17258 : D1C1CD68083E0FD7 = 1017
17266 : 322E70E1CDD271AF = 1136
17274 : 322E70C911167001 = 561
17282 : 0500CDC372ED532F = 886
17290 : 70C9111870010600 = 476
17298 : CDC372ED533170C9 = 1196
17306 : CDE772ED532C70C3 = 1221
17314 : CC71CDE772CDF572 = 1431
17322 : 112570010200CDC3 = 569
17330 : 72D52A2F70ED5238 = 903
17338 : 152A3170ED5B2F70 = 711
17346 : ED52E5C12A2F70D1 = 1151
17354 : 03ED80C3CC712A31 = 1019
17362 : 70ED5B2F70ED52E5 = 1147
17370 : C1E10309E5D12A31 = 959
17378 : 7003EDB0C3CC71CD = 1253
17386 : E772ED536073CD2A = 1123
17394 : 0ACD1571CD0000F5 = 799
17402 : 3A2640FEFF28F9F1 = 1199
17410 : C3C671CDE772CDF5 = 1506
17418 : 7211217001 0400CD = 486
17426 : C3727B2A2F707723 = 707
17434 : 222F70ED5B3170ED = 919
17442 : 52CACC7118ED110C = 891
17450 : 70010A00CDC372ED = 874
17458 : 533370EB11357001 = 664
17466 : 0300EDB0ED5B3370 = 907
17474 : 2186730103 00EDB0 = 747
17482 : C3CF71C3B973CD2E = 1261
17490 : 71ED5B3370213570 = 592
17498 : 010300EDB0C3C971 = 926
17506 : CDE772CD2A0A2A2F = 896
17514 : 700E000508E5CD45 = 643
17522 : 70E1CD70703E00CB = 1001
17530 : 7620017ED7230478 = 551
17538 : FE0F20E93E08814F = 812
17546 : FE2020DF3A2640FE = 955
17554 : DFCD0671FEFD200A = 1285
17562 : 2A2F702B222F70C3 = 632
17570 : D173FEFB20E62A2F = 1180
17578 : 702318F0CFFF1127 = 929
17586 : 70010500CDC3723A = 690
17594 : 3870172137700600 = 397
17602 : 4F09732372CD1571 = 591
17610 : C3C671 = 506
```

routine. When the breakpoint is reached, the memory at that point is replaced to its original contents, so if the breakpoint is required again it will have to be set again.

**ROUTINE 5:** This displays a block of memory from the address specified by Start, but displays the contents of the memory as characters corresponding to the value of the address. Enter the routine by ".5 Newline", and in response to Start, type 0100 newline. This displays a part of the ZX-81 ROM where the data for the keywords is stored. To advance the display press Z, to go backwards press 1. To return to the normal panel display type H. Only those characters with codes 0-63 and their inverses are displayed, others are shown as spaces.

**ROUTINE 6:** This quits the panel display, and returns to Basic. To re-enter the panel type

RAND USR 29126

**ROUTINE 7:** This allows you to change the values of the Z-80 registers AF, BC, DE, HL, IX and IY as shown in the top left corner of the display. This can be useful if you wish to give a particular register a value before jumping to a machine code subroutine with ".2". The register cursor, as shown in figure 1 indicates which register is to be changed. It is

When you have selected the register to be altered, enter ".7 Newline", and you will be prompted for the value you wish the register to take. This value will not take effect until you run a machine code subroutine using ".2". Do not attempt to alter the values of IX and IY unless you know what you are doing, as you could crash the computer.

These are the only routines implemented at present, though there is the facility for at least eight more that you may wish to implement yourself. A jump table is located at 72A1 hex from which the program is vectored to each of the routines. The vector of the first unused routine, that is ".8" is located at 72B3. The start address of your routine would be stored low byte at 72B3 and high byte at 72B4. The start address for ".9" would be stored at 72B5 and so on, up to ".F" which would be stored at 72C1 hex.

If you wish to input parameters for your routine there are subroutines within the program which will help you. To input a start address call 72E7, on return the value input will be in the DE register, and also stored at 702F/7030 hex.

To input a finish address call 72F5, on return the value input will be in the DE register and also stored at 7031/7032 hex. To input a parameter with a different prompt message, store your message in the memory at a convenient point, load the DE register with the start address of the message, load the BC register with the length of the message, then call 72C3.

This subroutine will display the prompt, input the value, and return with the value input in the DE register. Only four-digit hex numbers can be input in this way. End your routine with a jump either to 71C6 if the screen has been cleared, or to 71CC otherwise. Some routines that come to mind are search and replace routines, a dis-assembler, or some Basic utilities.

A general breakdown of the program is (all addresses in hex):

| | |
|---|---|
| 7000-702B: | Data for messages. |
| 702C-7044: | System variables. |
| 7045-705E: | Print at B register (y coord), C register (x coord). |
| 705F-706F: | Print value of B reg in hex. |
| 7070-707D: | Print value of HL followed by colon. |
| 707E-70B1: | Print four columns of hex addresses/contents. |
| 70B2-70F9: | Routines for printing in decimal. |
| 70FA-715A: | Routines to store, load and print registers. |
| 715B-716D: | Move register cursor. |
| 716E-7181: | Print two dotted lines across screen. |
| 7182-719E: | Clear bottom six lines of screen. |
| 719F-71B7: | Wait for key press, return value in A reg. |
| 71B8-71C5: | Decode a hex number on screen, value in A reg. |
| 71C6-728A: | Accept key presses, check and evaluate inputs. |
| 728B-72A0: | Jump to selected routine. |
| 72A1-72C2: | Jump table. |
| 72C3-7302: | Input routines already discussed. |
| 7303-7435: | Routines 0 to 7. |

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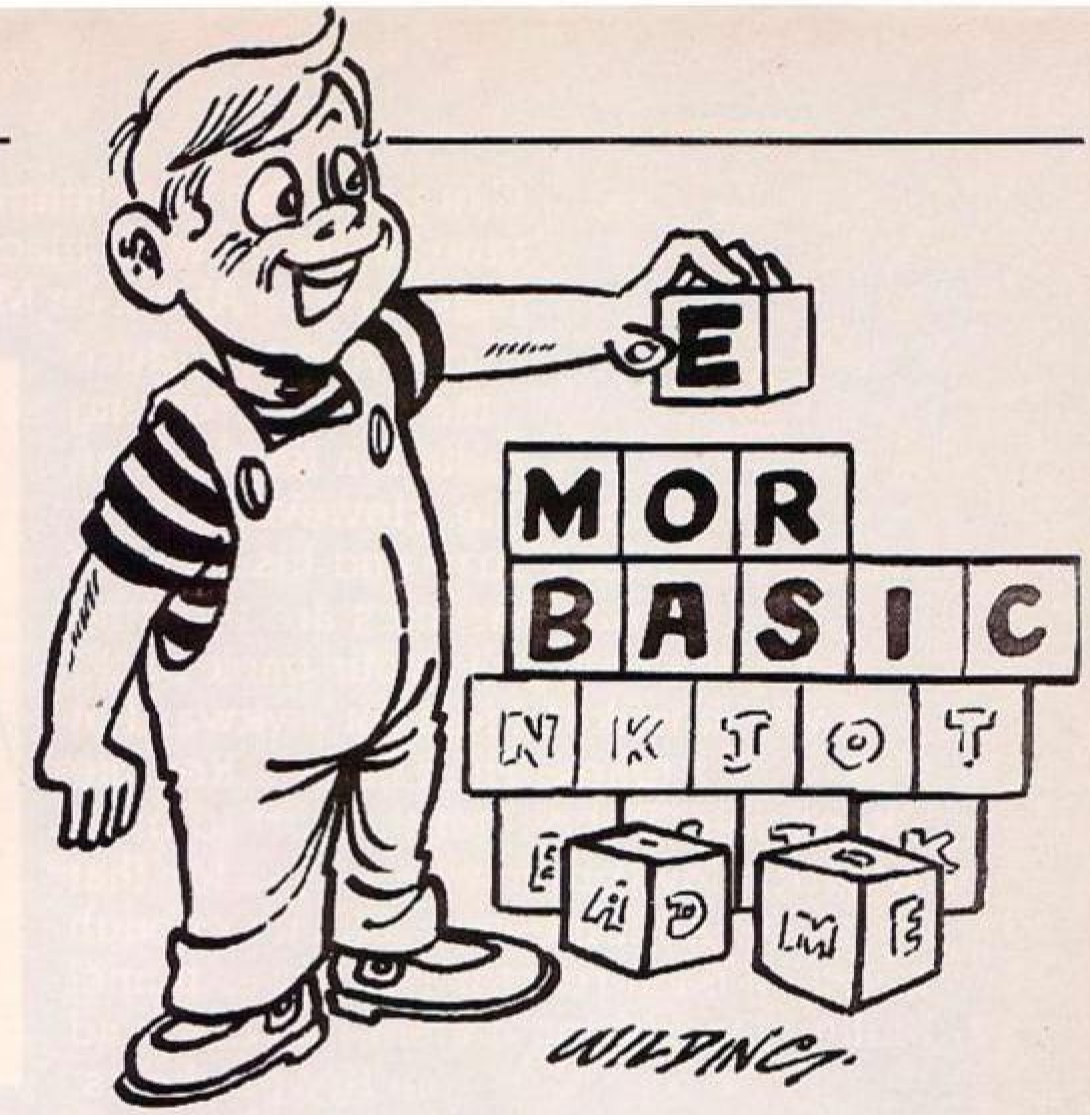
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# CBM-64




# EXTENDED BASIC

THE COMMODORE 64 with its extensive sound and graphics facilities has many features seldom found on other computers. Unfortunately it has an outdated and totally inadequate resident Basic, and as a result the programmer has to look up complicated Peeks and Pokes to make use of the sound, sprites and other features. Not only does it take a long time to write a program in this manner, but also making a mistake in the Poke statement can cause the computer to crash irretrievably.

To remedy this problem, I have written in machine code a set of routines to do all the necessary Pokes for you. The routines are accessed using the Sys statements followed by the routine's name and its parameters.

To enter the program, first type in program 1 and save it at the beginning of a cassette. Then type in program 2, and run it. There will probably be numerous data entry errors, so there is a checksum for every line. If you get an error, correct the appropriate line and rerun the program. If all the data is correct, you will be asked to position the cassette. At this point make sure that the tape is positioned just after program 1, then press a key. The data will then be saved. It is a good idea to save program 2 elsewhere as a back-up.

To use the new commands, rewind the tape to the beginning and press Shift and Run/Stop. The computer will take care of itself from then on.

The following commands should now be available:

**VOLume** — sets the overall volume.
Format: SYS49664, "VOL" volume 0-15.

**ENVelope** — sets the attack rate, decay rate, sustain level and release rate.
Format: SYS49664, "ENV" voice 1-3, attack 0-15, decay 0-15, sustain 0-15, release 0-15.

**SILEnce** — clears the SID chip, turns everything off. This routine should be used before and after using sound.
Format: SYS49664, "SIL".

**PULse** — sets the width of the pulse wave.
Format: SYS49664, "PUL" voice 1-3, width 0-4095.

**WAVe** — sets a waveform for a particular voice.
Format: SYS49664, "WAV" voice 1-3, waveform 0-3 where 0 = triangle, 1 = saw-tooth, 2 = pulse, 3 = noise.

**VOIce** — turns on, or off, a particular voice and sets its pitch.
Format: SYS49664, "VOI" voice 1-3, pitch 0-96 where 0 = off.

**SOUnd** — turns on a voice at a particular pitch for a set duration, then turns it off again.
Format: SYS49664, "SOU" voice 1-3, pitch 0-96 where 0 is off and duration 0-32767 — 100 is about one second.

**POInter** — sets sprite pointer.
Format: SYS49664, "POI" sprite 0-7, location 0-16383. If you have changed the video bank, add the starting location of that bank on to the second parameter for the correct location. Also, the pointer is set to the last multiple of 64 if the location required is not divisible by 64.

**ENAble** — turns a sprite on or off.
Format: SYS49664, "ENA" sprite 0-7, off/on 0/1 0 = off, 1 = on.

**SPRite** — positions as sprite at x,y co-ordinates.
Format: SYS49664, "SPR" sprite 0-7, x 0-511, y 0-255. Note that some co-ordinates are off the screen and will will not be visible.

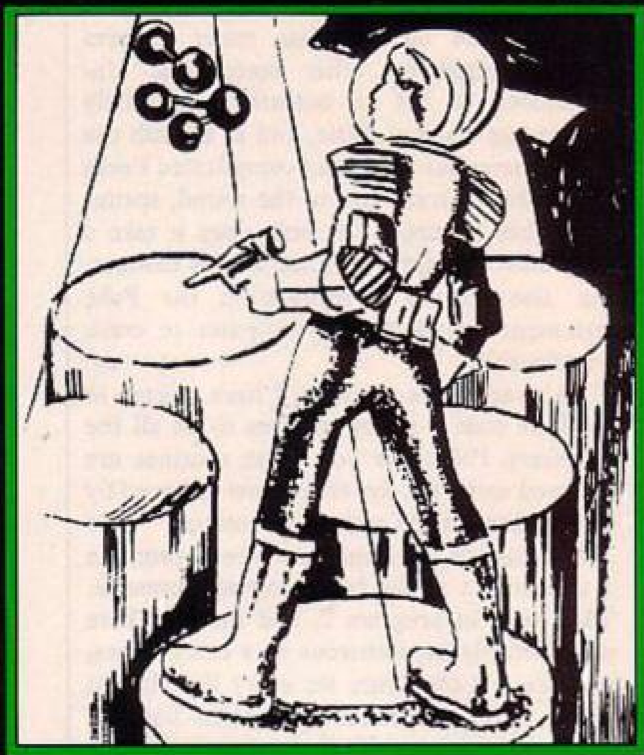
**Sprite COlour** — sets a sprite's colour.
Format: SYS49664, "SCO" sprite 0-7, colour 0-15 — multicolour off/on 0/1. This last

*(continued on page 129)*

*Listing 1*

```
5 REM PROGRAM 1
10 IFFL=0THENFL=1:LOAD"EXTENSION 64",1,1
20 PRINT"[illegible]*** CBM 64 BASIC V2 + NEW COMMANDS ***[illegible]"
30 FB=FRE(0)-65536*(FRE(0)<0)+205
40 PRINTTAB(7)FB"BASIC BYTES FREE"
50 POKE785,0:POKE786,194
60 NEW
```

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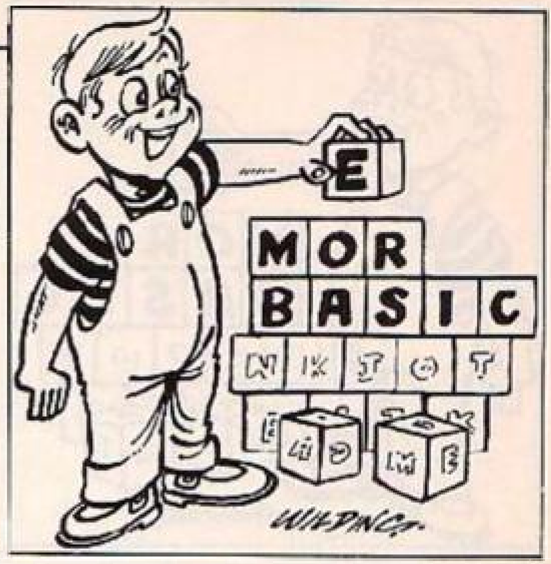
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*Demonstration Game*

```
5 YS=49664
10 INPUT"JMMMINSTRUCTIONS";A$:IFLEFT$(A$,1)="Y"THEN9000
20 GOSUB5000
500 IFTI$>"000020"THENGOSUB4900
505 P=P+4*(USR(0),"JOY"0,3)-4*(USR(0),"JOY"0,2)
507 P=P+4*(PEEK(197)=12)-4*(PEEK(197)=36)
510 P=P+4*(P>335)-4*(P<0)
520 SYSYS,"SPR"1,P,229
530 IF(USR(0),"CCL"0,0)THENGOSUB4000
540 Y=Y+DY:X=X+DX
550 IFY<56THEN6500
560 IFX>323THENDX=-DX:SYSYS,"SOU"1,70,1:X=323
570 IFX<24THENDX=-DX:SYSYS,"SOU"1,70,1:X=24
580 SYSYS,"SPR"0,X,Y
585 IFY>225THEN6200
590 IF(USR(0),"CCL"0,0)THENGOSUB4000
600 IF(USR(0),"CCL"0,1)THENGOSUB4500
610 GOTO500
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*(continued on next page)*

*(continued from page 127)*

parameter is optional but if it is included, 0 turns multicolour off for that sprite and 1 turns it on.

**SIZe** — expands or contracts a sprite.
Format: SYS49664, "SIZ" sprite 0-7, expand in x direction where 0 = no, 1 = yes; expand in y direction where 0 = no, 1 = yes.

**PRIority** — tells computer whether to put a sprite above or below text.
Format: SYS49664, "PRI" sprite 0-7, below/above 0/1 where 0 = below, 1 = above.

**Sprite MUlticolours** — sets sprite multicolours 1 and 2
Format: SYS49664, "SMU" multicolour 1 0-15, multicolour 2 0-15.

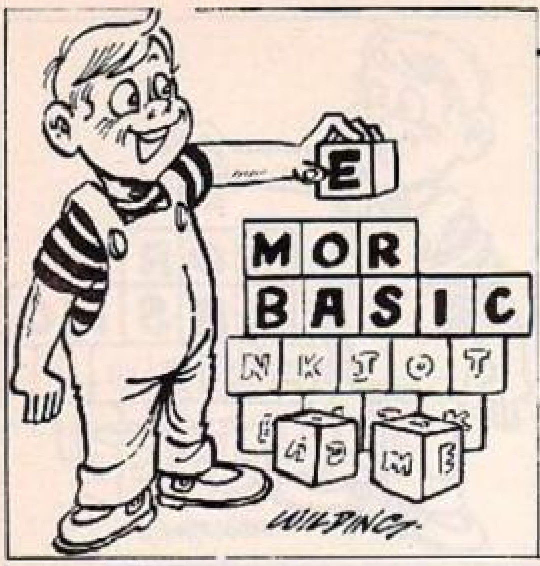
**Left SCroll** — scroll whole or part of screen one character to left.
Format: SYS49664, "LSC" top line to scroll 0-24, bottom line to scroll 0-24. The second parameter must be greater than the first.

**Right SCroll** scroll whole or part of screen one character to right.
Format: SYS49664, "RSC" top line to scroll 0-24, bottom line to scroll 0-24. The second parameter must be greater than the first.

*(continued on next page)*

```
1 REM PROGRAM 2
2 REM ******************
3 REM *                *
4 REM * CBM 64  BASIC  *
5 REM *                *
6 REM *   EXTENSION    *
7 REM *                *
8 REM * A.STURT  1984  *
9 REM *                *
10 REM******************
80 FS$="C646":REM FREE SPACE STARTS HERE
90 GOTO5000
100 REM NAMES & ADDRESSES
110 DATA VOL,C280,ENV,C295,SIL,C2E4,PUL,C2F2,WAV,C320,VOI,C460,SOU,C4BB
120 DATA FOI,C510,ENA,C538,SPR,C55B,SCO,C590,SIZ,C5CA,PRI,C604,SMU,C629
130 DATA LSC,C685,RSC,C6CD,BOR,C715,BAC,C723,BLA,C731,SCR,C751,POS,C799
140 DATA CUR,C7C6,JOY,C7F2,COL,C01D
290 DATA*
999 REM CODE
1000 DATA 20,73,00,A2,00,20,73,00,9D,A7,02,E8,E0,03,D0,F5,1694
1010 DATA A2,A0,8D,A0,C0,CD,A7,02,D0,27,BD,01,C0,CD,A8,02,1921
1020 DATA D0,1F,BD,02,C0,CD,A9,02,D0,17,20,73,00,C9,22,D0,1819
1030 DATA F9,3A,4A,A9,BD,00,C1,85,A7,BD,01,C1,85,A8,6C,A7,2272
1040 DATA 00,E8,E8,E8,BD,00,C0,D0,04,E8,4C,12,C2,A2,0B,6C,2090
1050 DATA 00,03,98,48,8A,48,20,86,AF,70,FA,B1,84,A7,85,A8,1756
1060 DATA 68,AA,68,A8,A5,A7,60,86,A9,C5,F9,B0,0C,A2,0E,6C,2108
1070 DATA 00,03,C0,FF,F0,07,C8,84,A9,C5,F9,B0,FE,60,00,00,2076
1080 DATA 20,52,C2,A2,00,A0,0F,20,67,C2,FD,18,D4,29,F0,85,1669
1090 DATA A7,8D,18,D4,60,20,52,C2,A2,01,F0,03,20,67,C2,AA,1773
1100 DATA CA,A9,D4,85,FE,A9,05,85,FD,E0,00,F0,0E,18,A5,FD,2447
1110 DATA 69,07,85,FD,CA,4C,A9,C2,A0,00,E4,02,20,52,C2,A2,1903
1120 DATA 00,A0,0F,20,67,C2,0A,0A,0A,0A,ED,A7,02,20,52,C2,1162
1130 DATA A2,00,A0,0F,20,67,C2,0D,A7,02,F4,02,91,FD,C8,C0,1804
1140 DATA 02,D0,D7,60,A2,19,A9,00,9D,FF,D3,CA,D0,FA,20,73,2307
1150 DATA 00,60,20,52,C2,A2,01,A0,03,20,67,C2,AF,CA,A9,D4,1812
1160 DATA 85,FE,A9,02,85,FD,E0,00,F0,0B,18,A5,FD,69,07,85,2106
1170 DATA FD,CA,4C,05,C3,20,52,C2,A9,0F,C5,A8,B0,03,4C,6D,1953
1180 DATA C2,A0,00,A5,A7,91,FD,A5,A8,C8,91,FD,60,20,52,C2,2419
1190 DATA A2,01,A0,03,20,67,C2,85,FD,AA,A9,00,9D,A9,02,20,1740
1200 DATA 52,C2,A2,00,A0,03,20,67,C2,AA,A9,10,E0,00,F0,05,1754
1210 DATA 0A,CA,4C,4C,C3,A6,FD,9D,A9,02,60,79,00,C9,2C,F0,2008
1220 DATA 01,60,20,52,C2,A2,00,A0,01,20,67,C2,85,FE,A9,01,1614
1230 DATA A6,FD,E0,01,F0,05,0A,CA,4C,72,C3,85,FD,A5,FE,F0,2531
1240 DATA 09,AD,17,D4,05,FD,8D,17,D4,60,A9,FF,38,E5,FD,85,2242
1250 DATA FE,2D,17,D4,8D,17,D4,60,00,00,00,00,00,00,00,00,1006
1260 DATA AC,01,1C,01,78,01,3E,01,51,01,66,01,7B,01,91,01,506
1270 DATA A9,01,C3,01,DD,01,FA,01,18,02,38,02,5A,02,7D,02,1142
1280 DATA A3,02,CC,02,F6,02,23,03,53,03,86,03,BB,03,F4,03,1317
1290 DATA 30,04,70,04,B4,04,FB,04,47,05,98,05,ED,05,47,06,1159
1300 DATA A7,06,0C,07,77,07,E9,07,61,08,E1,08,6A,09,F7,09,1265
1310 DATA 8F,0A,30,03,DA,0B,8F,0C,4E,0D,18,0E,EF,0E,D2,0F,1203
1320 DATA C3,10,C3,11,D1,12,EF,13,1F,15,60,16,B5,17,1E,19,1337
1330 DATA 9C,1A,31,1C,DF,1D,A5,1F,87,21,86,23,A2,25,DF,27,1585
1340 DATA 3E,2A,C1,2C,6B,2F,3C,32,39,35,63,38,BE,3B,4B,3F,1257
1350 DATA 0F,43,0C,47,45,4B,BF,4F,7D,54,83,59,D6,5E,79,64,1537
1360 DATA 73,6A,C7,70,7C,77,97,7E,1E,86,18,8E,8B,96,7E,9F,1956
1370 DATA FA,A8,06,B3,AC,BD,F3,C9,56,D4,8F,E1,F8,EE,2E,FD,3002
1380 DATA 20,52,C2,A2,01,A0,03,20,57,C2,AA,CA,86,FC,A9,D4,2102
1390 DATA 85,FE,A9,00,85,FD,E0,00,F0,0B,18,A5,FD,69,07,85,2104
1400 DATA FD,CA,4C,76,C4,20,52,C2,A2,00,A0,60,20,67,C2,C9,2101
1410 DATA 90,B0,0A,A0,04,A6,FC,BD,9A,02,91,FD,60,A0,00,AA,1985
1420 DATA 0A,0A,0A,AA,BD,A0,C3,91,FD,BD,A1,C3,C8,91,FD,A6,2771
1430 DATA FC,BD,AA,02,AC,04,09,01,91,FD,60,20,60,C4,20,52,C715
1440 DATA 02,A5,F7,D0,07,A5,A8,D0,33,4C,93,C4,38,A5,A7,E9,2325
1450 DATA 01,85,F7,A5,AE,E9,00,85,A8,A2,F9,A0,00,C8,D0,FD,2400
1460 DATA E8,D0,FA,20,E1,FF,F0,03,4C,C1,C4,60,48,A9,01,E0,2472
1470 DATA 20,F0,05,0A,CF,4C,CF,C4,7A,A0,00,60,F0,06,9A,11,1803
1480 DATA FD,91,FD,60,8E,FB,30,A9,FF,E5,FB,31,FD,91,FD,60,2888
1490 DATA 20,52,C2,A2,00,A0,07,20,57,C2,85,FB,20,52,C2,A5,1823
1500 DATA 98,A2,00,A0,3F,20,67,C2,86,A7,26,A8,06,A7,26,A8,1648
1510 DATA A5,A8,A6,FB,9I,F8,07,60,20,52,C2,A2,00,A0,07,20,1927
1520 DATA 57,C2,85,FB,20,52,C2,A2,30,A0,01,20,67,C2,A6,FB,2058
1530 DATA 90,15,84,FD,A0,D0,84,FE,4C,EC,C4,20,52,C2,A2,00,2298
1540 DATA A0,07,20,67,C2,85,FC,20,52,C2,A5,A8,A2,00,A0,31,1845
1550 DATA 20,67,C2,A6,FC,A0,10,84,FD,FA,D0,84,FF,20,FC,C4,2526
1560 DATA 06,FC,A6,A7,A6,FC,9D,00,D0,20,52,C2,9D,01,D0,50,2143
1570 DATA 20,52,C2,A2,00,A0,07,20,67,C2,85,FE,20,52,C2,A2,1820
1580 DATA 00,A0,0F,20,67,C2,A6,FB,9D,27,D0,20,79,00,C9,2C,1723
1590 DATA F0,01,60,20,52,C2,A2,00,A0,01,20,67,C2,A6,FB,A0,1874
1600 DATA D0,84,FE,A0,1C,84,FD,4C,EC,C4,20,52,C2,A2,00,A0,2305
1610 DATA 07,20,67,C2,85,02,20,52,C2,A2,00,A0,01,20,67,C2,1431
1620 DATA A6,02,AA,D0,84,FF,A0,1D,84,FD,20,EC,C4,20,52,C2,2262
1630 DATA A2,00,A0,01,20,67,C2,A0,D0,84,FE,A0,17,84,FD,A6,2140
1640 DATA 02,4C,EC,C4,20,52,C2,A2,00,A0,07,20,67,C2,85,FB,1860
1650 DATA 20,52,C2,A2,00,A0,01,20,67,C2,A6,FB,A0,D0,84,FE,2131
1660 DATA A0,1B,84,FD,49,01,4C,EC,C4,A0,00,84,A7,20,52,C2,1785
1670 DATA A2,00,A0,0F,20,67,C2,A6,02,9D,25,D0,E8,86,02,E0,1829
1680 DATA 02,D0,EA,60,20,52,C2,A2,00,A0,18,20,67,C2,8D,A7,1831
1690 DATA 02,20,52,C2,A2,00,A0,18,20,67,C2,8D,A8,02,CD,A7,1663
1700 DATA 02,B0,03,4C,6D,C2,60,A9,00,85,FB,A9,04,85,FC,C0,1959
1710 DATA 00,D0,01,60,18,A5,FB,69,28,85,FB,A5,FC,65,00,85,1929
1720 DATA FC,88,4C,6F,C5,20,44,C6,AC,A7,02,20,67,C6,AE,A7,2085
1730 DATA 02,A0,01,B1,F3,88,91,FB,C8,18,A5,FC,69,D4,85,FC,2465
1740 DATA B1,FB,88,91,FB,38,A5,FC,E9,D4,85,FC,C8,C0,C0,28,2895
1750 DATA D0,E1,88,A9,20,91,FB,18,A5,FB,69,28,85,FB,A5,FC,2552
1760 DATA 69,00,85,FC,E8,EC,A8,02,90,C7,F0,C5,60,20,44,C6,2302
1770 DATA AC,A7,02,20,67,C6,AE,A7,02,A0,26,B1,F3,C8,91,FB,2239
1780 DATA 88,18,A5,FC,69,D4,85,FC,B1,FB,C8,91,F3,38,A5,FC,2775
1790 DATA C9,D4,05,FC,80,88,C0,FF,D0,E1,C8,A9,20,91,FB,18,2003
1800 DATA A5,FB,69,28,85,FB,A5,FC,69,00,85,FC,E8,EC,A8,02,2490
1810 DATA 90,C7,F0,C5,60,20,52,C2,A2,00,A0,0F,20,67,C2,8D,1991
1820 DATA 20,D0,60,20,52,C2,A2,00,A0,0F,20,67,C2,8I,21,D0,1692
1830 DATA 60,20,52,C2,A2,00,A0,01,20,67,C2,C0,00,FC,0D,AD,1677
1840 DATA 11,D0,29,EF,8D,11,D0,60,AD,11,D0,09,10,8I,11,D0,1755
1850 DATA 60,20,52,C2,A2,26,A0,28,20,67,C2,C9,27,D0,03,4C,1663
1860 DATA 6D,C2,C9,26,D0,0B,AD,16,D0,29,F7,8D,16,D0,4C,79,2023
1870 DATA C7,AD,16,D0,09,08,8D,16,D0,20,52,C2,A2,19,A0,19,1669
1880 DATA 20,67,C2,C9,18,D0,09,AD,11,D0,29,F7,8D,11,D0,60,1919
1890 DATA AD,11,D0,09,08,8D,11,D0,60,20,52,C2,A2,00,A0,07,1514
1900 DATA 20,67,C2,85,F3,AD,16,D0,29,F8,05,FB,8D,16,D0,20,2064
1910 DATA 52,C2,A2,00,A0,07,20,67,C2,85,FB,AD,11,D0,29,F8,2005
1920 DATA 05,FB,8D,11,D0,60,20,52,C2,A2,00,A0,27,20,67,C2,1715
1930 DATA 85,02,20,52,C2,A2,00,A0,18,20,67,C2,AA,A4,02,4C,1530
1940 DATA F0,FF,A0,00,B1,FD,E0,00,F0,05,4A,CA,4C,E6,C7,29,2375
1950 DATA 01,60,20,52,C2,A2,00,A0,01,20,67,C2,48,20,52,C2,1437
1960 DATA A2,00,A0,04,20,67,C2,AA,68,A8,A9,1C,85,FE,A9,00,2042
1970 DATA 85,FD,20,E4,C7,49,01,A8,A9,00,6C,05,00,20,52,C2,1677
1980 DATA A2,00,A0,07,20,67,C2,48,20,52,C2,A2,00,A0,01,20,1393
1990 DATA 67,C2,A8,68,AA,A9,D0,85,FE,A9,1E,85,FD,20,E4,C7,2547
2000 DATA A8,A9,00,6C,05,00,AF,A4,AC,8C,FF,E4,FE,8F,EF,20,2151
2010 DATA*
2999 REM STORE STATEMENT NAMES & ADDRESSES
3000 A1=49152:A2=49408
3010 READA$:IFA$="*"THEN3050
3020 FORN=1TO3:POKEA1-1+N,ASC(MID$(A$,N,1)):NEXT:POKEA1+3,0
3030 READH$:GOSUB20000:POKEA2+1,INT(D/256):POKEA2,D-PEEK(A2+1)*256
3040 A1=A1+4:A2=A2+2:GOTO3010
3050 POKEA1-1,255:RETURN
3999 REM STORE CODE
4000 A=49664
4010 CS=0:READH$:IFH$="*"THENRETURN
4020 GOSUB20000:CS=CS+D:POKEA,D:A=A+1
4030 FORN=1TO15:READH$:GOSUB20000
4040 POKEA,D:A=A+1:CS=CS+D:NEXT
4050 READC:IFC<>CSTHENPRINT"DATA ERROR IN"PEEK(63)+256*PEEK(64):END
4060 GOTO4010
5000 PRINT"JMMMMMMCBM 64 EXTENSION"
5010 PRINT"MLOADING DATA. PLEASE WAIT."
5020 GOSUB3000
5030 GOSUB4000
5040 PRINT"GET CODE TAPE READY,THEN PRESS A KEY...":POKE198,0:WAIT198,1
5045 A$="EXTENSION 64"
5050 FORN=1TO12:POKE678+N,ASC(MID$(A$,N,1)):NEXT
5060 POKE780,12:POKE781,167:POKE782,2
5070 SYS63469
5080 POKE253,0:POKE254,192:POKE780,253
5090 H$=FS$:GOSUB20000
5100 POKE782,INT(D/256):POKE781,D-PEEK(782)*256
5110 SYS65496
9999 END
20000 REM CONVERT HEX-DEC
20010 D=0
20020 IFH$>""THENFORI=1TOLEN(H$):W=ASC(MID$(H$,I,1))-48:D=D*16+W+(W>7)*7
20030 IFH$>""THENNEXT
20040 RETURN

READY.
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(continued from previous page)

**BORder** — sets border colour.
Format: SYS49664, "BOR" colour 0-15.

**BACkground** — sets background colour.
Format: SYS49664, "BAC" colour 0-15.

**BLAnk** — turns screen on or off. The screen should be turned off before using the 1515 printer to prevent a crash, and might also be blanked before a lengthy calculation as running speed is slightly increased when the screen is blanked.
Format: SYS49664, "BLA" off/on 0/1 where 0 = turn screen off, 1 = turn screen on.

**SCReen** — sets width and length of screen.
Format: SYS49664, "SCR" columns 38/40 rows 24/25.

**POSition** — sets the x and y scrolling registers. It can be used to move the whole screen up to one character in any direction.
Format: SYS49664, "POS" x position 0-7 — normally 0 — y position 0-7 — normally 3.

**CURSet** — sets cursor position.
Format: SYS49664, "CUR" x 0-39, y 0-24.0

There are also two functions available. The value in brackets after USR is a dummy argument and does not affect the functions.

**JOYstick** — reads joystick values.
Format: USR(0), "JOY" port 0/1 where 0 = port 2, 1 = port 1 — switch 0-4 where 0 = up, 1 = down, 2 = left, 3 = right, 4 = fire. The function returns a 0 if the switch is open and a 1 if the switch is closed.

**COLlision** — detects sprite/sprite or sprite/data 0/1 (sprite = 0, data = 1). The function returns one if the second argument is 0 and the sprite has collided with another sprite since the function was last used. It will also return one if the second argument is one and the sprite has collided with text since the function was last used. Otherwise it will return a zero.

The keywords do not have to be kept to the minimum of three characters. Any number of characters can be enclosed in the quotes as long as the first three letters are those given. Also, the numeric parameters should be enclosed in brackets if they include any calculations. If they consist of just a number or a variable no brackets are needed.

*Demonstration Game continued from previous page*

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599 END
4000 DX=DX+((X-P-14)/14)*(ABS(DY)/2):DY=-ABS(DY)
4010 SYSYS,"SOU"2,50,1
4020 RETURN
4500 X1=INT((X-24)/8):SYSYS,"CUR"X1,(INT((Y-50)/8))
4510 A$="                     "
4513 IFX1>=37THENA$="              "
4518 PRINTA$
4520 IFDY<0THENDY=-DY
4530 Z=USR(0),"COL"0,1
4540 SC=SC+1:SYSYS,"CUR"29,0:PRINT"SCORE "SC:SYSYS,"SOU"2,58,1
4550 RETURN
4900 TI$="000000":IFABS(DY)>5THENRETURN
4910 DY=SGN(DY)*(ABS(DY)+1)
4920 SYSYS,"CUR"10,0:PRINT"DIFFICULTY:"ABS(DY)-1
4930 SYSYS,"BOR"(ABS(DY))
4940 RETURN
5000 REM SETUP
5010 FORN=0TO126:READA:POKE832+N,A:NEXT
5020 SYSYS,"POI"0,832:SYSYS,"POI"1,896
5030 SYSYS,"SMU"5,7
5040 SYSYS,"SCOL"0,8:SYSYS,"SCOL"1,14,1
5045 SYSYS,"SIZ"0,0,0:SYSYS,"SIZ"1,1,0
5050 SYSYS,"SPR"0,511,0:SYSYS,"SPR"1,0,0
5060 SYSYS,"ENA"0,1:SYSYS,"ENA"1,1
5070 SYSYS,"BOR"2:SYSYS,"BAC"0
5075 PRINT"";:FORN=1TO10:POKE646,N+1
5080 IFN/2=INT(N/2)THENPRINT"┌┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┐";:GOTO5087
5085 PRINT"┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬";
5087 NEXT:PRINT
5090 SYSYS,"VOL"10
5100 SYSYS,"ENV"1,0,15,13,9:SYSYS,"WAVE"1,0
5105 SYSYS,"ENV"2,0,15,13,9:SYSYS,"WAVE"2,0
5110 Y=208:DY=-2:X=124:DX=RND(1)*4-2:P=200
5120 SYSYS,"ENA"0,1
5130 IF(USR(0),"COL"0,0)OR(USR(0),"COL"0,1)THEN5130
5140 PRINT"LIVES: 3  DIFFICULTY: 1":L=3
5150 TI$="000000"
5999 RETURN
6000 SYSYS,"WAV"1,1:SYSYS,"SOU"1,20,100
6010 SYSYS,"WAV"1,0
6020 L=L-1:IFL=0THEN6100
6025 SYSYS,"SPR"0,0,0:SYSYS,"SCOL"0,(5+L)
6030 PRINT"LIVES:"L:TI$="000000"
6040 Y=208:DY=-2:X=124:DX=RND(1)*4-2:P=200
6042 IF(USR(0),"COL"0,0)OR(USR(0),"COL"0,1)THEN6042
6045 GOSUB4920
6050 GOTO500
6100 FORN=40TO36STEP-1:SYSYS,"SOU"2,N,10:SYSYS,"BOR"(N-35):NEXT
6105 SYSYS,"BOR"6
6110 PRINT"PRESS SPACE OR FIRE........."
6130 IF(USR(0),"JOY"0,4=0)ANDPEEK(197)<>60THEN6130
6150 PRINT"":CLR:YS=49664:GOTO20
6500 FORN=36TO48:SYSYS,"SOU"2,N,10:SYSYS,"BOR"(N-36):NEXT
6510 SYSYS,"BOR"6
6520 SC=SC+10*L:SYSYS,"CUR"29,0:PRINT"SCORE "SC
6530 GOTO6110
8000 DATA0,248,0,7,255,0,31,255,192,60,255,224
8010 DATA60,255,224,121,255,240,121,255,240,115,255,240
8020 DATA243,255,248,243,255,248,243,255,248,243,255,248
8030 DATA243,255,248,115,255,240,121,255,240,121,255,240
8040 DATA60,255,224,60,255,224,31,255,192,7,255,0,3,248,0,0
8050 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8060 DATA60,0,0,255,0,3,255,192,15,0,240,12,0,48
8070 DATA63,195,252,48,195,12,0,255,0,0,60,0
8080 DATA42,170,168,42,170,168,4,0,16,21,0,84,21,0,84,4,0,16
9000 SYSYS,"BOR"6:SYSYS,"BAC"6
9010 PRINT""TAB(16)"BREAKOUT"
9020 PRINTTAB(16)"────────"
9030 PRINT"KNOCK THE BRICKS OUT OF THE WALL BY"
9040 PRINT"BOUNCING THE BALL OFF YOUR BAT USING"
9045 PRINT"Z-LEFT, M-RIGHT OR JOYSTICK IN PORT 2."
9050 PRINT"EVERY 20 SECONDS THE BALL SPEEDS UP"
9060 PRINT"AND BECOMES MORE DIFFICULT TO CONTROL."
9070 PRINT"THE GAME ENDS IF THE BALL HITS THE"
9080 PRINT"GROUND 3 TIMES OR REACHES THE TOP OF"
9090 PRINT"THE SCREEN. IF THE LATTER HAPPENS YOU"
9100 PRINT"GET A BONUS WHICH VARIES DEPENDING ON"
9110 PRINT"THE NUMBER OF LIVES YOU HAVE LEFT."
9120 PRINT"PRESS SPACE OR FIRE TO BEGIN......."
9130 GOTO6130
9999 RETURN
```

## Demonstration

I have written a demonstration game — program 3 which uses the new commands. Look in the listing if you are unsure about how to use any of them.

To add your own commands, first load the existing new vocabulary as normal. Next, load program 2. Now use your assembler or monitor to enter the routine, which should start at the location held in FS$, line 80. The following subroutines should be useful:

$C252 gets an integer from the Basic text and puts it in $A7 and $A8, with the least-significant byte in the accumulator.

$C267 checks that the number in the accumulator is greater than or equal to the number in the X register and less than or equal to that in the Y register. If it is not, the subroutine produces an illegal quantity message.

$C4EC puts the number in the accumulator, which must be 0 or 1, in bit X of the location held in $FD and $FE.

$C7E4: puts bit X of the location held in $FD and $FE into the accumulator.

## Saved

When you have done this, change line 80 so that FS$ contains the next free byte after your last routine. Add the first three letters of the new command's name, followed by its start address in hexadecimal, to the Data before line 290. There is room for a total of 64 new commands. Finally, type in direct mode:

FS$ = "(start of free memory, in hex)": GOSUB 3000: GOTO 5040.

The data will now be saved.

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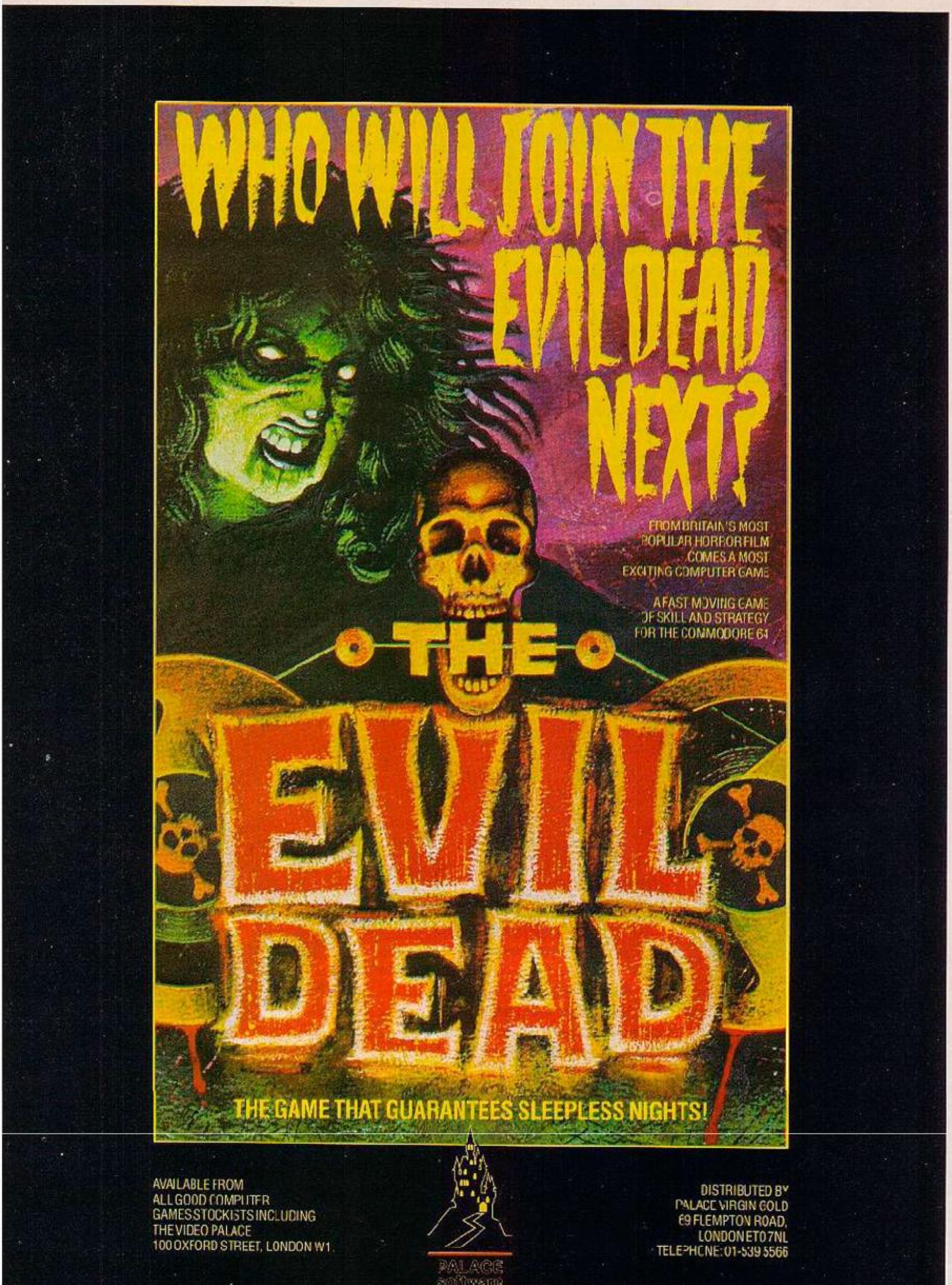
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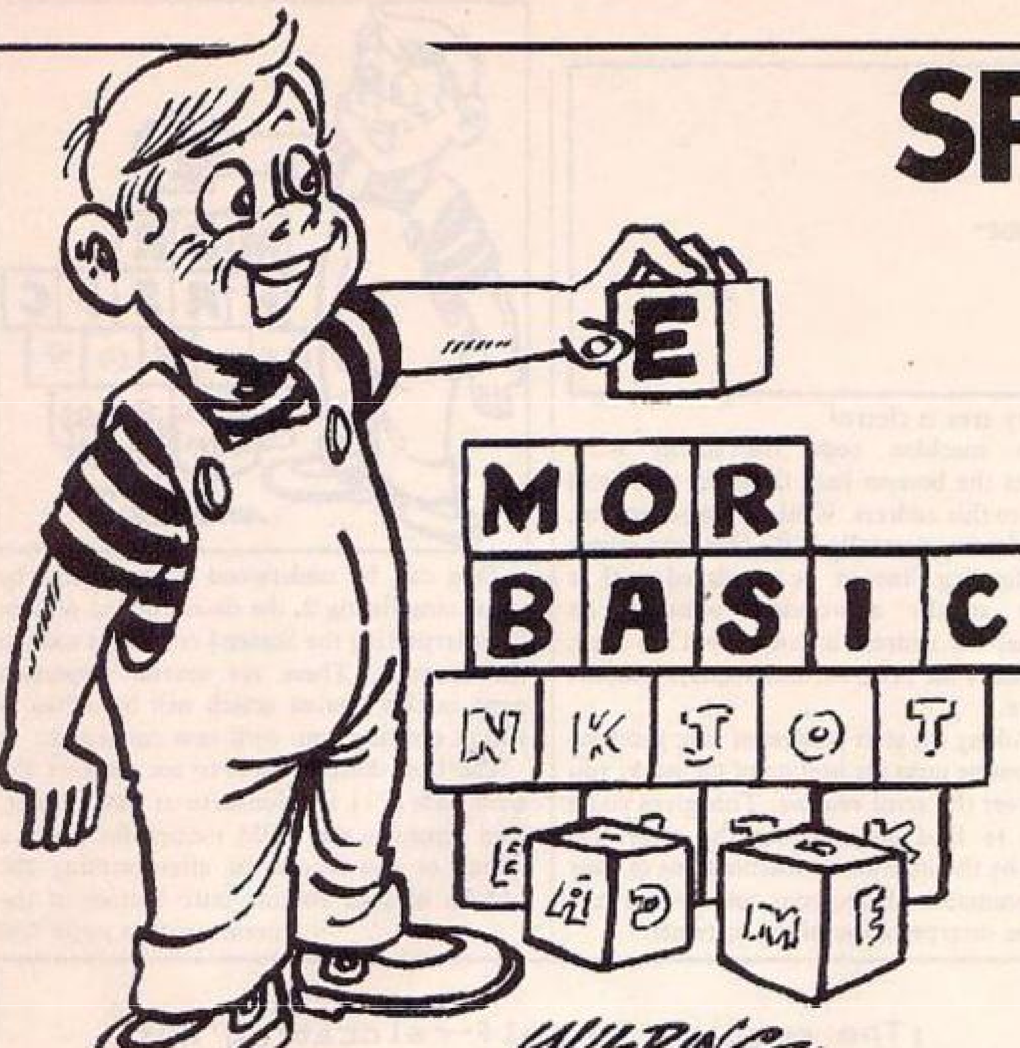
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# SPECTRUM EXTENDED BASIC

USING INTERFACE 1, it is possible to extend the Spectrum's Basic interpreter and add your own commands — see, for example, the article by Kathleen Peel in February's *Your Computer*. I have discovered another method of doing this which does not use Interface 1, and will work whether or not it is fitted. It can be used on any Spectrum, either 16K or 48K.

The ability to add your own commands can be very useful. It allows you to produce customised versions of Basic for particular applications. For example, you could add extra graphics commands to assist in writing arcade games, or add toolkit routines to help while debugging programs.

Any new command which you decide to use must fail the normal syntax checking in ROM. Two ways of doing this are particularly suitable for this method. The easiest is to use one of the keyword tokens RND to Step as your command. Listing 1, for example, demonstrates Screen$ used in this way. Note that this does not affect the normal use of the token — for example Screen$ as a function.

The other method is to invent new words such as *Renum and *Trade which would need to be typed letter by letter. The "*", or another shifted character, is required to get out of K cursor mode. Just like any other command, your new one could then be followed by a number of parameters — for example *Renum 100,10 might renumber from line 100 in steps of 10.

The program in listing 1 sets up and demonstrates the use of a new command Screen$ which can be used to change the paper and ink colours of the whole screen without erasing its contents. The new command has the syntax:

SCREEN$ paper colour, ink colour(eg. SCREEN$ 5,1)

Listing 1 can be used on both 16K and 48K computers. First type in lines 1 to 21. These lines set up the machine code routine which recognises, checks syntax, and interprets the new command.

The machine-code loader includes a checksum, but even so it is best to Save these lines before you try a Run, because if you have made a mistake in the Data statements the computer might crash. If everything seems OK when you Run these lines, you can test the new command by typing:

SCREEN$ 5,1

as a direct command which should change the screen colours to cyan paper and blue ink. If this works you can now delete lines 1 to 19 before entering the rest of the program. You must leave lines 20 and 21 however, otherwise the new command will not be recognised when you Run the program.

The method for adding new commands is to intercept the error routine which is used by the interpretor when an incorrect command is found. The address of the error routine is the bottom item on the machine stack, and it is pointed to by system variable ERR-SP — address 23613/4. The occurrence of an error (during either syntax-checking or runtime)

*(continued on next page)*

*Listing 1.*

```
   1 REM ** SCREEN$ as command *
   2 REM (C) Robert Newman 1984
   3 REM
   4 CLEAR 32400+32700*(PEEK 23733=255)
   5 LET start=1+PEEK 23730+256*PEEK 23731
   6 RESTORE : LET sum=0
   7 FOR j=start TO start+157
   8 READ n: POKE j,n
   9 LET sum=sum+n
  10 NEXT j
  11 IF sum<>16918 THEN  PRINT "Checksum error": STOP
  12 REM
  13 DATA 58,58,92,254,11,40,35,253,203,1,126,32,8,42,178,92,35,2
29,195,183,18,205,3,19
  14 DATA 253,54,0,255,42,89,92,205,167,17,42,178,92,35,229,195,1
80,18,42,93,92,43,126,254
  15 DATA 170,32,212,253,54,0,255,253,54,39,0,205,122,28,253,203,
0,126,40,195,254,13,40,8
  16 DATA 253,54,0,11,254,58,32,183,253,54,0,255,253,203,1,126,32
,12,42,176,92,35,229,33
  17 DATA 183,18,229,195,118,27,42,141,92,34,143,92,205,148,30,25
4,8,40,5,E7,55,205,53,34
  18 DATA 205,148,30,254,8,40,5,87,167,205,53,34,205,173,28,58,14
1,92,33,0,88,17,1,8E
  19 DATA 1,255,2,119,237,176,42,178,92,35,229,195,118,27
  20 LET errsp=PEEK 23613+256*PEEK 23614
  21 POKE errsp,start-256*INT (start/256): POKE errsp+1,INT (star
t/256)
  22 REM ************************
  23 REM * RUN lines 1 - 21
```

*Listing continued on next page.*

*(Listing 1 continued from previous page)*

```
24 REM  before typing rest of program
30 REM
40 CLS : LIST 23:SCREEN$ 5,1
50 FOR j=1 TO 3
60 PRINT '''PRESS A KEY FOR COLOUR CHANGE"
70 NEXT j
80 FOR j=2 TO 7
90 PAUSE 0
100SCREEN$ j,0
110 NEXT j
```

causes the following actions from the ROM:

☐ The address reached by the interpreter system variable CH ADD — is copied to the error pointer — X PTR.

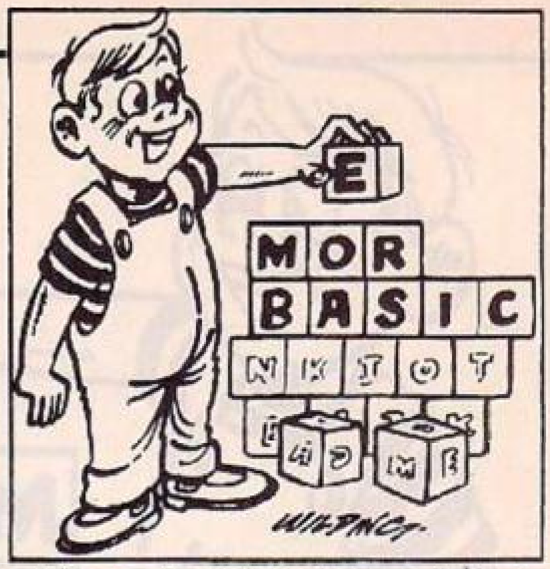
☐ The error code is put into ERR NR. The error code is one less than the report code which is printed after a runtime error. For example, the error code is 255 for report 0 (OK), and is 11 for report C — Nonsense in Basic. An unrecognised command would have an error code of 11 during both syntax checking and runtime.

☐ The stack pointer is loaded from ERR SP, and so it points to the bottom item on the machine stack.

☐ The floating-point calculator stack and memory area is cleared.

☐ The machine code instruction RET removes the bottom item from the stack and jumps to this address. While syntax-checking, this address is normally 12B7 Hex, and causes the offending line to be displayed with a marker at the appropriate position. At runtime, the address is normally 1303 Hex, which halts the program and displays a report message.

By Poking the start address of your machine code routine onto the bottom of the stack, you can divert the error routine. This gives you a chance to find out whether the error was caused by the interpreter reaching one of your new commands If so, your routine can take over the interpretation of the statement.




This can be understood more clearly by examining listing 2, the disassembled routine for interpreting the Screen$ command used in the example. There are several important parts in this routine which will be useful to you in creating your own new commands.

The first thing to do is to see whether the error code is 11 for Nonsense in Basic. If not, then return to the ROM routine for either a syntax or run-time error after pushing the address of your routine onto bottom of the

*(continued on page 136)*

*Listing 2.*

```
          ORG  RAMTOP+1        ;The routine is self-relocating but
                               ;must be put just above RAMTOP
START     LD   A,(23610)       ;Was the error code = 11 for
          CP   11              ;"Nonsense in BASIC"?
          JR   Z,NONSENSE
ERROR     BIT  7,(IY+1)        ;Bit 7 of FLAGS is set at runtime
          JR   NZ,RUNERROR
SYNTXERR  LD   HL,(23730)      ;Syntax error. START = RAMTOP + 1.
          INC  HL              ;START is put onto bottom of stack
          PUSH HL              ;ready for next error.
          JP   12B7H           ;Back to ROM at this address.
RUNERROR  CALL 1303H           ;Runtime error - produce report.
          LD   (IY+0),255      ;Clear error number
          LD   HL,(23641)      ;Remove floating point forms from
          CALL 11A7H           ;line in editing area before
          LD   HL,(23730)      ;doing a syntax check
          INC  HL              ;Put START on bottom of stack
          PUSH HL
          JP   12B4H           ;Return to ROM
NONSENSE  LD   HL,(23645)      ;CH ADD is the address reached by
          DEC  HL              ;interpreter. Obtain character
          LD   A,(HL)          ;which caused the error.
          CP   170             ;Was it SCREEN$ ?
          JR   NZ,ERROR        ;Error if not.
          LD   (IY+0),255      ;Reset ERR NR and X PTR, and then
          LD   (IY+38),0       ;check for two
          CALL 1C7AH           ;numbers separated by comma.If not
          BIT  7,(IY+0)        ;found, ERR NR will indicate an
          JR   Z,ERROR         ;error. CH ADD has been advanced
          CP   13              ;and A contains the next character
          JR   Z,OK            ;which must be ENTER or a colon
          LD   (IY+0),11       ;else give "Nonsense in BASIC"
          CP   58              ;error.
          JR   NZ,ERROR        ;
OK        LD   (IY+0),255      ;Syntax is OK, so reset ERR NR
          BIT  7,(IY+1)        ;If runtime the command can now be
          JR   NZ,DO-IT        ;obeyed
```

*(continued on page 136)*



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*(continued from page 134)*

stack — it will be addressed by ERR SP ready for the next error.

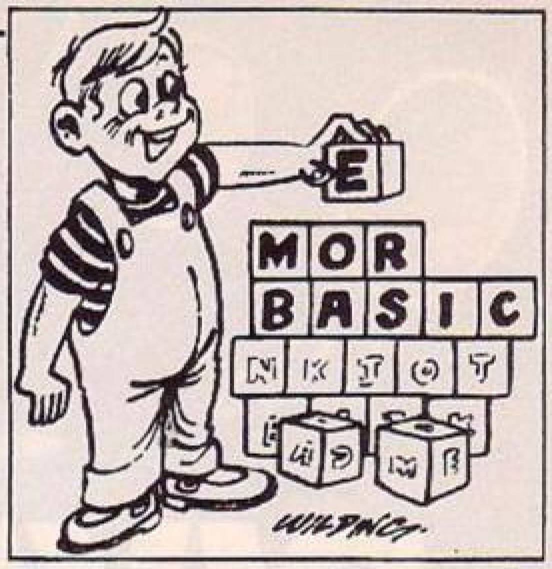
If the error code was 11, then the error may have been caused by your new command. At this stage, system variable CH ADD points to the character in the line after the one which caused the error. If you command uses one of the tokens RND to Step — e.g., Screen$ — then it is easy to test for the appropriate code. If you choose new keywords which are typed letter by letter, such as *Renum, then each character should be individually tested, and CH ADD advanced along the line as you do so by using RST 18H and RST 20H — see table 1. If your new command did not cause the error, then a return to the ROM can be made.

After identifying the command, your routine must make sure that it is followed by the correct number of expressions, and during runtime they must be evaluated. The easiest way to do this is to use the line-scanning routines in ROM — see table 1.

Before calling these, CH ADD must point to the first character of the expression, and afterwards it will point to the character following the expression. At run-time, the value of the expression is put onto the calculator stack.

The final syntax check which must be made is to ensure that the last character of the

*(continued on page 138)*




*(Listing 2 continued from page 124)*

```
         LD    HL,(23730)     ;else the addresses START and
         INC   HL             ;12B7H are put onto stack and a
         PUSH  HL             ;return to the ROM is made.
         LD    HL,12B7H
         PUSH  HL
         JP    1B76H
DO-IT    LD    HL,(23693)     ;Execution. First permanent colours
         LD    (23695),HL     ;are copied to temporary colours.
         CALL  1E94H          ;The INK colour is unstacked
         CP    8              ;If it was 8, the ink is left
         JR    Z,PAPER        ;unchanged, else the ROM routine
         LD    D,A            ;is used to change ATTR T ink
         SCF
         CALL  2235H
PAPER    CALL  1E94H          ;Paper colour is unstacked, and
         CP    8              ;if it was not 8, the ROM routine
         JR    Z,OUT          ;is used again
         LD    D,A
         AND   A
         CALL  2235H
OUT      CALL  1CADH          ;Temp colours are made permanent.
         LD    A,(23693)      ;LDIR instruction is used to make
         LD    HL,5800H       ;the attributes colours the same
         LD    DE,5801H       ;as ATTR P.
         LD    BC,2FFH
         LD    (HL),A
         LDIR
         LD    HL,(23730)     ;START is put onto the bottom of
         INC   HL             ;the stack ready for the next
         PUSH  HL             ;error, and a return to the ROM
         JP    1B76H          ;is made.
```

*Table 1.*

| ADDRESS (Hex) | ACTION |
|---|---|
| 18 | RST 18H loads the accumulator with the character from the program addresesed by CH ADD. Non printable characters (e.g colour codes) are ignored and CH ADD advanced until a valid character is found. |
| 20 | RST 20H. CH ADD is incremented and the next character from the program put into the accumulator. |
| 1C82 | A numeric expression is evaluated and its value put on the calculator stack if runtime. CH ADD should point to the first character of the expression before |

*(continued on page 138)*




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(continued from page 136)
statement is Enter or a colon. CH ADD should point to this character, otherwise the Basic interpreter will be upset when you return. If syntax-checking, the return can now be made after resetting the stack.

At runtime the command can now be executed. The start address of your routine is replaced on the bottom of the stack, and a jump back to the ROM made.

Any number of new commands can be added to the interpreter using this method. Each one will need its own syntax-checking and runtime routine. If you want to try this for yourself, the example in listing 2 will give you an idea of what is involved.

After writing your machine code routine, it can then be loaded into memory. The best place to put it is above RAMtop, using the Clear command to reserve some space for it. Before your new command(s) will be recognised, you must Poke the start address fo the machine-code routine onto the bottom of the stack as in lines 20 and 21 of listing 1.

Similar Pokes must be included at the beginning of any program which uses your extended Basic. Although your routine should replace its start address onto the stack each time it is called, the Run command has the effect of clearing the stack and returning the normal error address. The Pokes are needed in the program to overcome this.

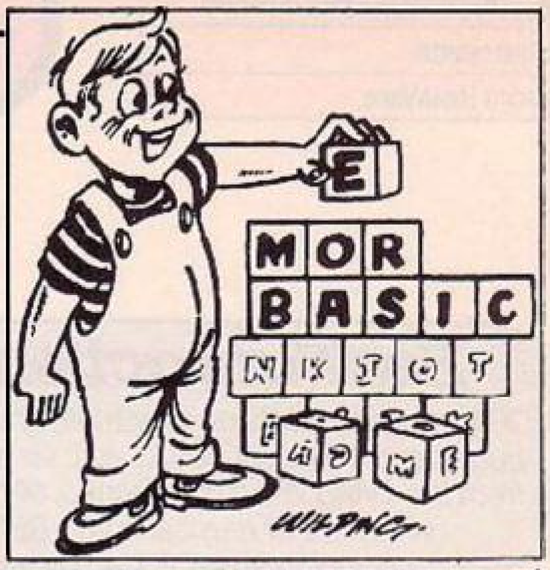



Table 1 continued from page 136.

| | |
|---|---|
| | calling this routine, and afterwards it points to the next character after the expression. If the expression was numeric, bit 6 of system variable FLAGS is set (reset for a string). |
| 1C7A | Evaluate two numeric expressions, separated by a comma and put values onto calculator stack if runtime. CH ADD and FLAGS as for 1C82. |
| 1E94 | Take number off calculator stack and put into the accumulator. The number must be positive and less than 256. |
| 1E99 | Take number off calculator stack and put into BC. The number must be positive and less than 65536. |

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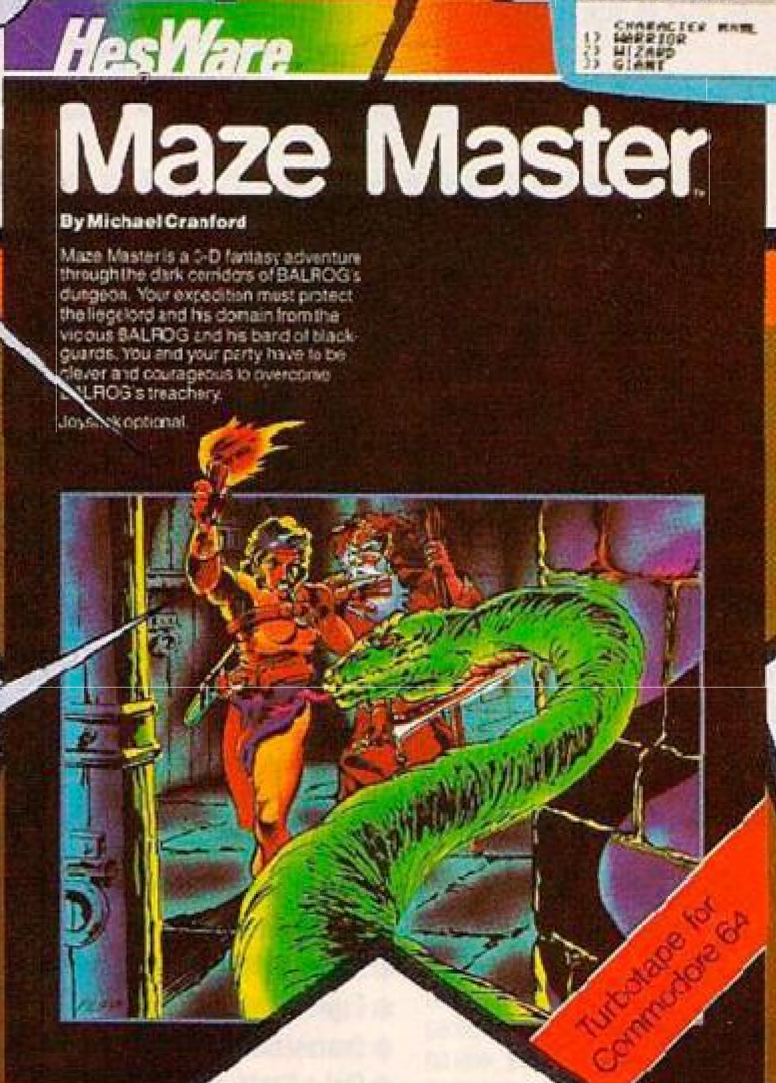
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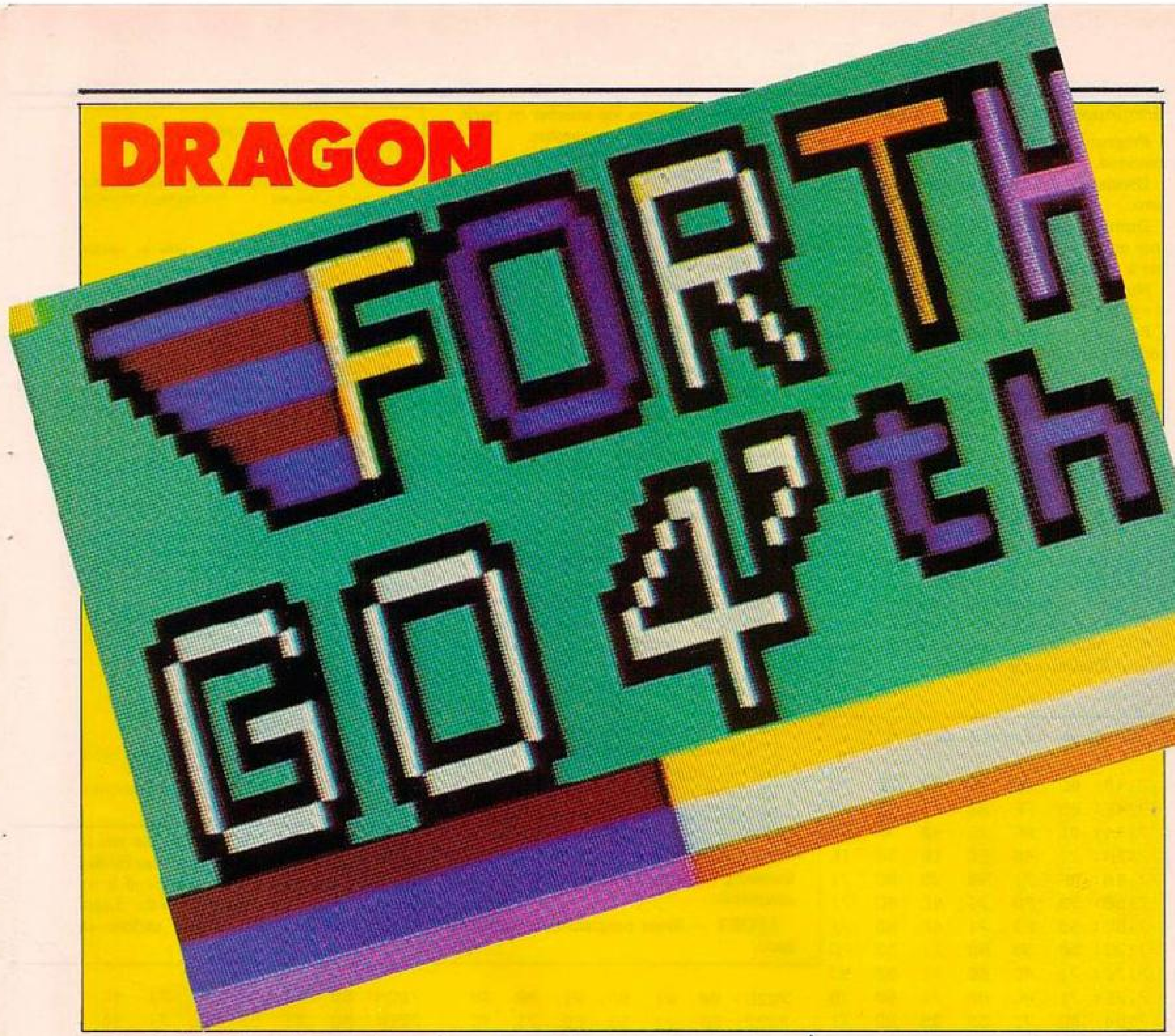
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# DRAGON




THIS PROGRAM IS Dragon Forth for the Dragon 32/64. As many people have read articles in back issues of *Your Computer* I will not explain the fundamentals of the language although I will explain my implementations of the words. Although the compiler is slow, once compiled programs will run up to 50 times as fast as Basic.

Typing it in is quite a task but if you have time you will be well rewarded. First you type in the Basic program then save it and autorun i.e., Goto 1210 – line 1240, if included in your programs, will make it autorun.

Next you type in the machine code or assembly code if you have DASM. Once this is done and checksum matches then save it after the Basic compiler. If you leave a big space between the Basic and machine code then that would be safer. To save the machine code use

CSAVEM"F WORDS",29000,30100,34010

The compiler and Forth is well error checked so it is just about impossible to crash it unless you use USR or Exec.

Some of the following errors may occur during execution:

Loops Not Nested — Do Loop; Repeat Until; Begin While loops not nested or Exit without Do-Loop.

*continued on next page*

```
10 CS=0
20 FOR A=&H7148 TO &H758B
30 IF LEN(A$)=0 THEN READ A$
40 POKE A,VAL("&H"+LEFT$(A$,2)):A$=RIGHT
$(A$,LEN(A$)-2)
50 CS=CS+PEEK(A)
60 NEXT
70 IF CS<>116842 THEN PRINT"CHECKSUM ERR
OR..":END
80 PRINT"DATA OK. PREPARE TAPE THEN
 PRESS A KEY."
90 AUDIOON:MOTORON
100 IF INKEY$="" THEN 100
110 CSAVEM"F WORDS",&H7148,&H758B,34010
120 PRINT"REWIND TAPE TO CHECK"
130 PRINT"THEN PRESS A KEY"
140 AUDIOON:MOTORON
150 IF INKEY$="" THEN 150
160 SKIPF"F WORDS"
170 PRINT"SAVED OK."
180 REM ********************************
**
190 REM *HEXADECIMAL DATA CAN BE ENTERED
 *
200 REM *AS 170 DATA EE,00,EE,00,39 ETC
 *
210 REM *OR 170 DATA EE00EE0039 ETC
 *
220 REM ********************************
**
```

*continued from previous page*

Program Aborted — Abort has been executed.

Divide By Zero — Attempt to divide by zero.

During compilation the following errors may occur — Undefined Word — Attempt to use a word that is not in the dictionary.

Number Too Big — Number >65535 or <-32767.

Bad Line — A programme line has been incorrectly entered.

Bad Variable — Variables other than A-Z have been used. The following is the system commands:

is >32767 then is is printed as a negative.

CLEAR — Clears all stacks.

*VLIST — List dictionary,

*LIST — List out source definitions,

*SAVE — Save all words and definitions to tape,

*LOAD — Load back into computer.

*DEL — Clear source buffer

*RESET — Restarts the program.

These are explanations of the core words:

+ — Adds top two numbers on the stack.

− — Subtracts top numbers.

DROP — Removes top number on stack.

DUP — Duplicates top number.

* — Multiply top numbers.

EMIT — Prints character whose ASCII value is on the stack.

Prints top number on stack. If the number

SWAP — Swaps top two numbers on stack.

OVER — Duplicates the second number.

= — As basic test leaves 1 if true and 0 if false.

<,<>,> All as =.

AND — Logical And.

OR — Logical Or.

EOR — Logical Exclusive Or.

? — Single byte Peek.

@ — Double byte Peek.

? — Single byte Poke.

?+ — Double byte Poke.

EXEC — Calls machine-code routine.

PRINT/PRINTOFF — Turns on/off printer.

USR — As Exec but returns value in D — Register.

KEY — Gets a keypress. 0 if no key pressed.

GET — As key but waits for a press.

$ — Prints a string of letters I.E. 'HELLO' $.

/ — Divides top numbers on stack.

DO .. LOOP — As FOR .. NEXT loop.

EXIT — Premature exit from DO LOOP.

LOOP — As loop but with step.

IND — Loop counter.

REPEAT .. UNTIL — as in beeb basic.

BEGIN .. WHILE — As REPEAT UNTIL.

IF — Tests flag on stack. If true it does following commands else jumps forward two commands.

ABORT — Stops program and returns to basic.

```
1 REM ***THE FORTH COMPILER***
10 CLEAR 2000,16999
20 PCLEAR4
30 IF PEEK(25500)<>129 THEN PRINT@0,"PLE
ASE WAIT LOADING..     ":SCREEN0,1:CLOADM"
F WORDS"
40 CLS
50 PRINT"DRAGON FORTH (C) 1984 B. WATSON
."
60 PRINT
70 AD=17000:A1=AD
80 EN=AD
90 VA=28000
100 GOSUB 1070
110 ED=0:SP=1
120 DIM S$(20)
130 IF ED  THEN RETURN
140 IF NOT ED THEN LINE INPUT">"; L$
150 ZZ=0
160 IF L$="" THEN 140
170 IF LEFT$(L$,1)="%" AND DE=0 THEN GOT
O 320
180 IF DE OR LEFT$(L$,1)=":" THEN S$(SP)
=L$:S1=SP:SP=SP+1:ZZ=1:A1=AD
190 IF SP>20 THEN PRINT"SOURCE BUFFERS F
ULL. DO YOU WISHTO CLEAR THEM ";:INPUT Q
$:IF Q$="Y" THEN SP=1:S1=SP:FOR E=1 TO 2
0:S$(E)="":NEXT:SP=2:S$(1)=L$
200 IF SP>20 THEN 130
210 IF LEFT$(L$,1)=":" AND RIGHT$(L$,1)<
>";" THEN E=2:SP=S1:S$(SP)="":GOTO 1140
220 IF L$=":;" THEN E=2:SP=S1:S$(SP)="":
GOTO 1140
230 IF LEFT$(L$,1)=":" THEN 280
240 IF RIGHT$(L$,1)=";" THEN 320
250 IF DE THEN 360
260 AD=EN:GOSUB 470
270 POKE AD,57:EXEC EN:AD=EN:A1=FD:GOTO
130
280 FD=1:GOSUB 910:W$=RIGHT$(W$,LEN(W$)-
1)
```

If the program is a bit daunting for you to type in I will supply a copy which has Hi-Res text and a few examples for £4. Send it to: Brian Watson, 33 Moredun Vale Loan, Edinburgh EH17 7RJ. Please enclose an SAE.

Hex dump of core word 1/C.

```
7148: 6D  60  6F  54  36  00
714E: 05  FF  BE  71  48  ED
7154: 81  BF  71  48  39  BE
715A: 71  48  EC  1E  30  1E
7160: BF  71  48  39  3D  71
7166: 59  FD  71  4C  3D  71
716C: 59  F3  71  4C  3D  71
7172: 50  39  BD  71  59  FD
7178: 71  4C  BD  71  59  B3
717E: 71  4C  BD  71  50  39
7184: BD  71  59  39  3D  71
718A: 59  BD  71  50  3D  71
7190: 50  39  BD  71  59  FD
7196: 71  4C  BD  71  59  1F
719C: 01  CC  00  00  F3  71
71A2: 4C  30  1F  26  F9  BD
71A8: 71  50  39  BD  71  59
71AE: 1F  98  BD  B5  4A  39
71B4: BD  71  59  FD  71  4C
71BA: 48  24  15  FC  71  4C
71C0: 34  02  86  20  3D  B5
71C6: 4A  35  02  FC  71  4C
71CC: 83  7F  FF  FD  71  4C
71D2: FC  71  4C  BD  B5  7A
71D8: 39  8E  6D  60  3F  71
71DE: 48  8E  6F  54  3F  71
71E4: 4A  39  BD  71  59  1F
71EA: 02  BD  71  59  1E  02
71F0: BD  71  50  1F  20  BD
71F6: 71  50  39  BD  71  59
71FC: FD  71  4C  BD  71  59
7202: FD  71  4E  BD  71  50
7208: FC  71  4C  BD  71  50
720E: FC  71  4E  BD  71  50
7214: 39  BD  71  59  FD  71
721A: 4C  BD  71  59  10  B3
7220: 71  4C  27  07  CC  00
7226: 00  BD  71  50  39  CC
722C: 00  01  BD  71  50  39
7232: BD  71  59  FD  71  4C
7238: BD  71  59  10  B3  71
723E: 4C  27  07  CC  00  01
7244: BD  71  50  39  CC  00
724A: 00  BD  71  50  39  BD
7250: 71  59  FD  71  4C  BD
7256: 71  59  10  B3  71  4C
725C: 2D  07  CC  00  00  BD
7262: 71  50  39  CC  00  01
7268: BD  71  50  39  BD  71
726E: 59  FD  71  4C  BD  71
7274: 59  10  B3  71  4C  2E
727A: 07  CC  00  00  BD  71
7280: 50  39  CC  00  01  BD
7286: 71  50  39  BD  71  59
728C: FD  71  4C  BD  71  59
7292: 34  71  4C  F4  71  4D
7298: BD  71  50  39  BD  71
729E: 59  FD  71  4C  BD  71
72A4: 59  BA  71  4C  FA  71
72AA: 4D  BD  71  50  39  BD
72B0: 71  59  FD  71  4C  BD
72B6: 71  59  B8  71  4C  F8
72BC: 71  4D  BD  71  50  39
72C2: BD  71  59  1F  01  B6
72C8: 00  E6  84  BD  71  50
72CE: 39  BD  71  59  1F  01
72D4: EC  84  BD  71  50  39
72DA: BD  71  59  FD  71  4C
72E0: BD  71  59  BE  71  4C
72E6: ED  84  39  BD  71  59
72EC: FD  71  4C  BD  71  59
72F2: BE  71  4C  E7  84  39
72F8: BD  71  59  1F  01  6E
72FE: 84  8E  80  0F  BF  01
7304: 68  86  7E  B7  01  67
730A: 39  8E  39  39  BF  01
7310: 67  39  BD  71  59  1F
7316: 01  AD  84  BD  71  50
731C: 39  BD  80  06  1F  89
7322: 4F  BD  71  50  39  BD
7328: 80  06  81  00  27  F9
732E: 1F  89  4F  BD  71  50
7334: 39  BD  71  59  1F  01
733A: A6  84  81  00  27  08
7340: BD  B5  4A  30  01  7E
7346: 73  3F  39  BD  71  59
734C: FD  71  4C  10  83  00
7352: 00  27  1F  BD  71  59
7358: BE  00  30  30  01  B3
735E: 71  4C  10  B3  71  4C
7364: 2E  F5  10  B3  71  4C
736A: 26  02  30  01  1F  10
7370: BD  71  50  39  8E  74
7376: A5  BD  30  E5  7E  84
737C: DA  1F  41  EC  84  10
7382: BE  71  4A  ED  24  BD
```

```
290 DE=1:NC=NC+1:D$(NO)=W$:A(NO)=AD
300 IF LEN(D$(NO))<10 THEN D$(NO)=D$(NO)
+" ":GOTO 300
310 L$=RIGHT$(L$,LEN(L$)-PO+1):GOTO240
320 IF LEN (L$)>1 THEN L$=LEFT$(L$,LEN (
L$)-1):GOSUB 470
330 POKE AD,57:AD=AD+1:EN=AD
340 DE=0
350 GOTO 130
360 GOSUB 470:GOTO 130
370 L$=RIGHT$(L$,LEN(L$)-1)
380 IF L$="LIST" THEN 450
390 IF L$="DEL" THEN SP=1:S$(1)="":GOTO
130
400 IF L$="SAVE" THEN CSAVEM "FWORDS",17
000,EN,17000:OPEN"O",#-1,"FWORDS":PRINT#
-1,EN:PRINT# 1,NO:FOR J=1 TO NO:PRINT#-1
,D$(J),A(J):NEXT J:PRINT#-1,SP:FOR J=1 T
O SP:PRINT#-1,S$(J):NEXT:CLOSE #-1:GOTO
130
410 IF L$="LOAD" THEN PRINT"SEARCHING":C
LOADM "FWORDS":PRINT"LOADING":OPEN"I",#-
1,"FWORDS" INPUT #-1,EN:INPUT #-1,NO:FOR
 J=1 TO NO INPUT #-1,D$(J),A(J):NEXT J:I
NPUT #-1,SP:FOR J=1 TO SP:INPUT #-1,S$(J
):NEXT:CLOSE #-1:AD=EN:A1=AD:S1=SP:GOTO
130
420 IF L$="VLIST" THEN FOR I=1 TO NO:PRI
NTD$(I),:POKE 31365,0+19*(ABS(I/2<>INT(I
/2))):NEXTI:PRINT:PRINTNO;"ENTRIES    ";Z
8000-AD;"BYTES LEFT":GOTO 130
430 IF L$="RESET" THEN RUN
440 GOTO 130
450 FOR B=1 TO SP-1:PRINTS$(B):NEXT
460 GOTO 130
470 A1=AD:W$=""
480 IF LEFT$(L$,1)="(" THEN RETURN
490 PO=1:LA=0
500 IF LA THEN RETURN
510 GOSUB 910
520 IF LEFT$(W$,1)>="0" AND LEFT$(W$,1)
<="9" OR LEFT$(W$,1)="-" AND MID$(W$,2,1
)<>" " THEN 610
530 IF MID$(W$,2,1)="@" THEN 680
540 IF MID$(W$,2,1)="!" THEN 740
550 IF LEFT$(W$,1)="#" THEN 800
560 IF LEFT$(W$,1)=CHR$(34) THEN 840
570 IF LEN (W$)<10 THEN W$=W$+" ":GOTO 5
70
580 FOR I=1 TO NO:IF LEFT$(W$,10)<>D$(I)
 THEN NEXT I:E=1:GOTO 1140
590 POKE AD,&HBD:AD=AD+1:DD=A(I):GOSUB10
20
600 GOTO 500
610 DD=VAL (W$):IF DD<0 THEN DD=65536+DD
620 IF DD>65535 THEN E=3:GOTO 1140
630 IF DD<0 THEN E=3:GOTO 1140
640 POKE AD,&HCC
650 AD=AD+1:GOSUB 1020
660 GOSUB 1050
670 GOTO 500
680 V=ASC(W$)-65
690 IF V<0 OR V>25 THEN E=7:GOTO 1140
700 POKE AD,&HFC:AD=AD+1
710 DD=VA+V*2:GOSUB 1020
720 GOSUB 1050
730 GOTO 500
740 V=ASC(W$)-65
750 IF V<0 OR V>25 THEN E=7:GOTO 1140
760 GOSUB 1060
770 POKE AD,&HFD:AD=AD+1
780 DD=VA+V*2:GOSUB 1020
790 GOTO 500
800 W$=RIGHT$(W$,LEN(W$)-1)
810 IF LEFT$(W$,1)=" "THEN 500
820 POKE AD,VAL("&H"+LEFT$(W$,2)):AD=AD+
1
830 W$=RIGHT$(W$,LEN(W$)-2):GOTO 810
840 POKE AD,&HCC:AD=AD+1:DD=AD+7:GOSUB 1
020:GOSUB 1050
850 POKE AD,&H20:I=2
860 W$=W$+CHR$(34)
870 W$=RIGHT$(W$,LEN(W$)-1):IF LEFT$(W$,
1)=CHR$(34) THEN 890
880 POKE AD+I,ASC(W$):I=I+1:GOTO 870
890 POKE AD+I,0:POKE AD+1,I-1:AD=AD+I+1
900 GOTO 500
910 W$=""
920 LA=0
930 IF MID$(L$,PO,1)=" " THEN PO=PO+1:GO
TO 930
940 IF MID$(L$,PO,1)=CHR$(34) THEN PO=PO
+1:GOTO 990
950 FOR Z=PO TO LEN (L$):IF MID$(L$,Z,1)
<>" "THEN W$=W$+MID$(L$,Z,1):NEXT Z:Z=Z-
1:LA=1
960 IF LEN(W$)<10 THEN W$=W$+" ":GOTO 96
0
970 PO=Z+1
980 RETURN
990 FOR Z=PO TO LEN(L$):IF MID$(L$,Z,1)<
>CHR$(34) THEN NEXT Z:Z=Z-1:LA=1
1000 IF Z=LEN(L$) THEN LA=1
1010 W$=CHR$(34)+MID$(L$,PO,Z-PO):PO=Z+1
:RETURN
1020 POKE AD,INT(DD/256)
1030 POKE AD+1,DD-(256*PEEK(AD))
1040 AD=AD+2:RETURN
1050 POKE AD,&HBD:AD=AD+1:DD=&H7158:GOSU
B 1020:RETURN
1060 POKEAD,&HBD:AD=AD+1:DD=&H7159:GOSUB
 1020:RETURN
1070 Z=30000:DIM D$(82):DIM A(82):READ N
O:FOR I=1 TO NO:READ D$(I):A(I)=PEEK(Z)*
256+PEEK(Z+1):Z=Z+2
1080 IF LEN(D$(I))<10 THEN D$(I)=D$(I)+"
 ":GOTO 1080
1090 NEXT
1100 RETURN
1110 DATA 41
1120 DATA "+","-",DROP,DUP,"*",EMIT,".",
"CLEAR",SWAP,OVER,"=","<>","<",">","AND"
,"OR","EOR","?",@,!+,!,"EXEC","PRINTON",
"PRINTOFF","USR",KEY,GET
1130 DATA "$","/",DO,LOOP,EXIT,+LOOP,.NO
,REPEAT,UNTIL,BEGIN,WHILE,"IF","THEN",AB
ORT
1140 IF E=1 THEN PRINT"UNDEFINED WORD"
1150 IF E=7 THEN PRINT"BAD VARIABLE"
1160 IF E=2 THEN PRINTBAD LINE"
1170 IF E=3 THEN PRINT"NUMBER TOO BIG"
1180 AD=A1
1190 DE=0
1200 GOTO 130
1210 PCLEAR1:FOR A=0 TO 511:POKE 1024+A,
PEEK(1536+A):NEXT
1220 POKE 2300,PEEK(25):POKE2301,PEEK(26
):POKE2302,PEEK(27):POKE 2303,PEEK(28)
1230 POKE 1024,PEEK(1025)
1240 CSAVEM"FORTH" 150,PEEK(27)*256+PEEK
(28),0
1250 POKE 25,PEEK(2300):POKE26,PEEK(2301
):POKE27,PEEK(2302):POKE28,PEEK(2303)
1260 RUN
```

```
7388: 71 59 ED 94 BD 71    7436: 0B BE 71 4A EC 1D    74E4: B9 00 7D 00 FD 00
738E: 59 ED 22 86 01 A7    743C: 1F 01 32 62 6E 84    74EA: FD 00 FD 00 FD 00
7394: 26 31 27 10 BF 71    7442: BE 71 4A 30 1D BF    74F0: FD 00 F9 00 F1 00
739A: 4A 39 10 BE 71 4A    7448: 71 4A 39 1F 41 EC    74F6: FD 00 FD 00 FD 00
73A0: 31 39 A6 26 81 01    744E: 84 BE 71 4A ED 84    74FC: F9 00 F9 01 00 00
73A6: 26 58 EC 94 AE 22    7454: 86 03 A7 02 30 03    7502: 7F 00 2F 00 35 00
73AC: BF 71 4E 10 B3 71    745A: BF 71 4A 39 BE 71    7508: EE 00 CC 00 EE 00
73B2: 4E 27 46 C3 00 01    7460: 4A A6 1F 81 03 26    750E: EA 00 3F 00 77 10
73B8: FD A4 AF 24 32 62    7466: 99 AD 71 59 10 83    7514: 7F 00 64 00 EE 00
73BE: 6E 84 10 BE 71 4A    746C: 00 01 27 D2 BE 71    751A: EA 20 EA 20 EA 01
73C4: 31 39 A6 26 81 01    7472: 4A EC 1D 1F 01 32    7520: 3F 00 65 10 26 01
73CA: 26 34 EC 94 ED 22    7478: 62 6E 84 3D 71 59    7526: 24 00 EE 00 EA 00
73D0: 39 10 BE 71 4A 31    747E: 10 83 00 20 27 01    752C: EC 00 EA 00 71 64
73D6: 39 A6 26 81 01 26    7484: 39 1F 41 EC 84 C3    7532: 71 74 71 84 71 88
73DC: 23 EC A4 AE 22 BF    748A: 00 06 ED 84 39 39    7538: 71 92 71 AB 71 B4
73E2: 71 4E 10 B3 71 4E    7490: 8E 6D 60 3F 71 48    753E: 71 D9 71 E6 71 F9
73E8: 24 11 FD 71 4E BD    7496: 8E 6F 54 3F 71 4A    7544: 72 15 72 32 72 4F
73EE: 71 59 F3 71 4E ED    749C: 8E 74 C9 BD 90 E5    754A: 72 6C 72 89 72 9C
73F4: A4 AE 24 32 62 6E    74A2: 7E 84 DA 0D 44 49    7550: 72 AF 72 C2 72 CF
73FA: 84 10 BF 71 4A 39    74A8: 55 49 44 45 20 42    7556: 72 DA 72 E9 72 F8
7400: 8E 74 B6 3D 90 E5    74AE: 59 20 5A 45 52 4F    755C: 72 FF 73 0B 73 12
7406: 7E 84 DA BE 71 4A    74B4: 0D 00 0D 4C 4F 4F    7562: 73 1D 73 27 73 35
740C: EC 19 BD 71 50 39    74BA: 50 53 20 4E 4F 54    7568: 73 43 73 7D 73 9C
7412: 1F 41 EC 84 BE 71    74C0: 20 4E 45 53 54 45    756E: 73 C0 73 D1 74 09
7418: 4A ED 84 86 02 A7    74C6: 44 0D 00 0D 50 52    7574: 74 12 74 25 74 4B
741E: 02 30 03 BF 71 4A    74CC: 4F 47 52 41 4D 20    757A: 74 5E 74 7B 74 8F
7424: 39 BE 71 4A A6 1F    74D2: 41 42 4F 52 54 45    7580: 74 90 5F 20 FF 14
742A: 81 02 26 D2 BD 71    74D8: 44 0D 00 20 FF 00    7586: FF 30 FF 01 FF 10
7430: 59 10 83 00 01 27    74DE: FF 00 FF 20 FD 00    116842
```

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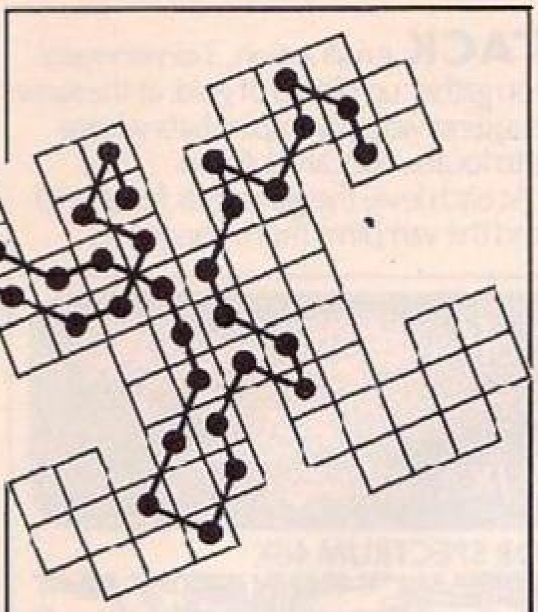
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# COLECO ADAM Competition RESULTS

FANS OF DOUGLAS Adam's book and TV series, the *Hitchhiker's Guide to the Galaxy*, will know it starred a computer named Deep Thought. In answer to the Ultimate Question about the Meaning of Life, the Universe and Everything Deep Thought came up with the number 42. This also happens to be the solution to May's Coleco Adam Competition.

42 is the maximum number of shapes you can touch on in sequence taking 41 steps to do so. There are two routes through the puzzle grid which give this figure. One is shown here. The other is almost the same except for a variation over two steps.

Well over 1,000 people entered the competition. Quite a few of them put their computers to the task of finding the solution. A look at the times their programs took to run through all variations throws an interesting light on the relative speeds of different machines and languages.

On the ZX-81 one program took three days before it found the answer. A more efficient version on the same machine cut the time down to 10 hours while on the BBC micro the job took six hours.

Several Spectrum owners used the popular Hisoft compiler to write programs in Pascal which checked all the routes in around two hours.

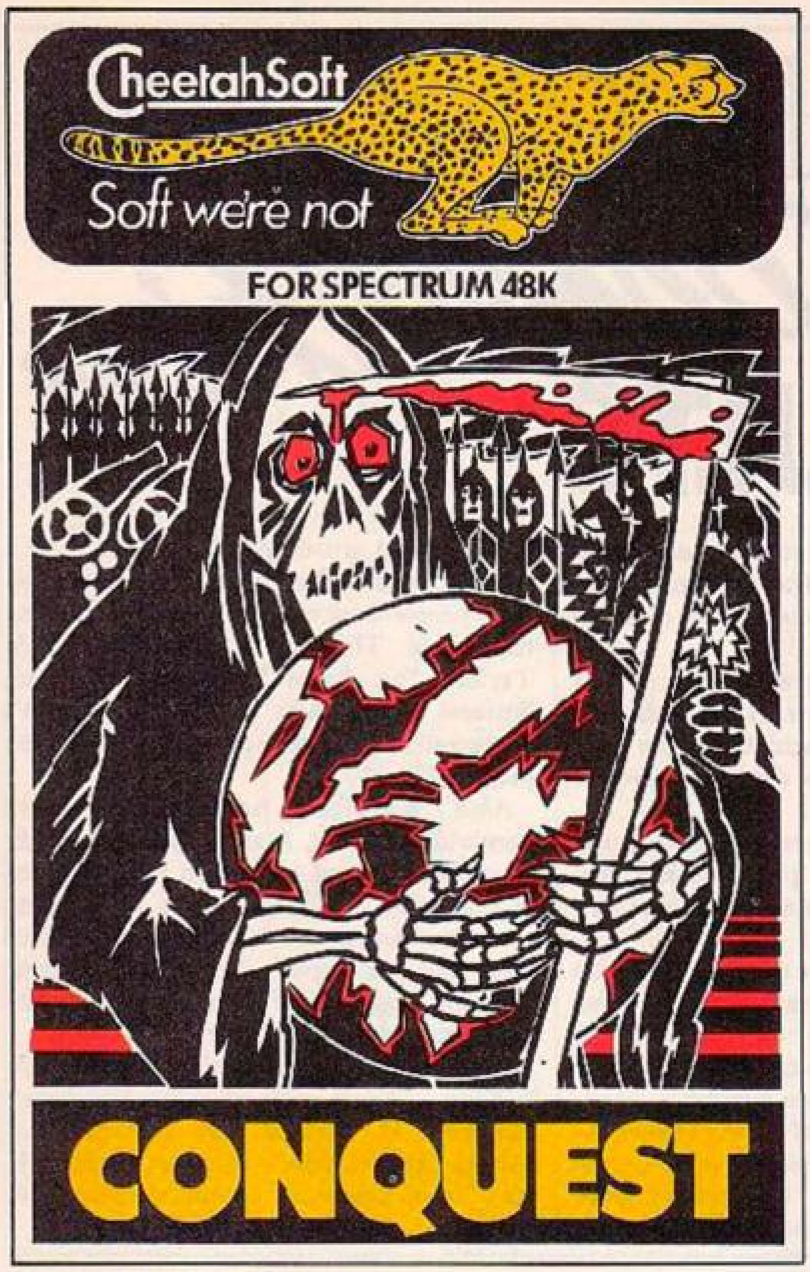
Pride of place, however, must go to the two entrants — one from Poland — who wrote their programs in machine code. These made swift work of the problem, coming up with the answer in just over two minutes.

In view of the number of correct answers — 130 of them — we awarded the prize on the basis of the tie-breaker. Competitors were asked to complete the sentence, "With arcade fun and word processing in one . . .".

Wit seemed in short supply this month and most people were content simply to carry on the rhyme. The best in this line were A. Taylor's "an Adam I'd treasure for both business and pleasure" and P. Holdsworth's "amusement's respected whilst words are perfected".

Alan Whitfield, however — of 48 Cambridge Avenue, Marton, Middlesbrough, Cleveland — found inspiration in the Garden of Eden. His was judged to be the winning entry: "an Adam would have enlightened Eve more than an Apple". On the same theme A. Wood suggested "If Eden had Adam would Eve even consider the Apple".

Other entries deserving of a mention were P. King's "Adam plays when work is done" and from D. Sinfield who expressed his feelings about Coleco's cabbage Patch dolls with "nice computer — shame about the doll".




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**Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".**

## CBM-64 BUGS?

☐ **I have recently acquired a Commodore 64, and have two queries about it. The first is that when the cursor-right key is used and then followed by cursor-up in quick succession, a spade — shifted A — is left at the point of change. The second is that when the operation FRE is used, I get a number in the region of − 26,000. I have found that if this number is added to 64,000 then a number in the correct region is gained, although my old Vic-20 directly printed up the number of bytes free. Are these bugs in my computer?**

*A W Duncan,*
*Baras Park, Cramlington.*

ONE IS A BUG, and one is just a fact of Commodore 64 life. The spade is due to a bug — common to all Commodore 64s — either in the Basic or the operating system. It seems that FRE on this computer can return either the number of bytes left, or a negative number. It depends on the circumstances in which the command is used. That is, on what the computer has been doing immediately prior to you using FRE. If the number is positive, then that is the number you use. If it is negative, add this number to 79,360 — 64 times 1240 — to obtain the answer you want.

## 6502 INFO

☐ **Would you kindly advise of any publications dealing with 6502 assembly language, and machine code, which could be used in conjunction with the BBC model B for the purpose of writing programs in these languages?**

*B V Dukinfield,*
*Poynton, Cheshire.*

PERHAPS THE best general guide to 6502 is Rodnay Zaks' *Programming the 6502*, Sybex. BBC-specific books you might find helpful are:
*Beginner's Guide to Assembly Language Programming on the BBC Micro* — Ross Symons
*Discovering BBC Machine Code* — Stephenson
*Assembly Language Programming for the BBC* — Ian Birnbaum
*6502 Assembly Language Programming* — Leventhal
*Assembly Language Programming for the BBC Micro* — John Ferguson and Tony Shaw

## STRING POSITIONS

☐ **I have a 48K Spectrum and want to work out anagrams on my computer. Please could you tell me how I can simulate Mid$, Left$ and Right$ using the Def FN function, as these are in the program I wish to use, but are not on the Spectrum keyboard.**

*Guy Westgate,*
*Shaftesbury, Dorset.*

MID$, LEFT$ and Right$ are the Microsoft Basic means of obtaining parts of strings. Nearly all computers with Basic use these. The Sinclair computers are the exception. You cannot use Def FN to simulate these, and I am sure that you would not want to do so, even if you could. All you need to do is understand what the Microsoft commands do, and then you can easily substitute the Sinclair string-handling commands for these. Mid$ is used to extract a portion of a string. Mid$(A$,3,2) takes two characters from the string A$, starting at the third character. The Sinclair equivalent is A$(3 to 5). Left$ also takes bits of a string, but starts at the left-hand end. This means that Left$(A$,2) would take the first two characters of A$. A$(to 2) is the Sinclair equivalent. Right$ does the opposite of Left$, stripping characters from the right-hand end of the string. Therefore, Right$(A$,2) in Microsoft Basic is A$(Len(A$) — 2 to).

## SAVE PROBLEM

☐ **I have been quite proud of my ZX-81, but now I have a Sinclair 16K RAMpack I have problems. With the RAMpack fitted, I find that Saved programs do not Load. Listening to the sound track, I can hear a humming interference on top of the usual noise pattern. Since my tape-recorder is a good one, and the problem does not occur without the RAM pack, I am pretty sure it is the pack which is causing the problem. If so, is there anything I can do about it?**

*Stephen Boyles,*
*Woking.*

IT SOUNDS AS if you have just bought your RAM pack. If this is so, take it back to the place you bought it from, explain the problem, and get a new one. If you have had the pack for some time, and this solution is not realistic, I suggest you borrow a RAMpack from a friend, and see if the same problem occurs. If it does, it sounds as if the problem is the computer. If not, it is your RAM pack which is faulty. In this case, I suggest you replace it.

## PERIPHERALS

☐ **I own a Sinclair Spectrum and would like to add a modem, disc drive and a printer/plotter capable of using standard stationery. Is this a practical proposition, or would I be better off using another manufacturer's computer as the base of such a system?**

*Paul Seward,*
*Kilkhampton, Cornwall.*

I GUESS IT would be possible, but you would have a pretty ugly mess of interfaces and the like. I would forget the idea of starting with a Spectrum. The set-up will never be as satisfactory as it would be if you started off with another machine. The BBC model B may well be worth considering for this.

## VIC ASSEMBLER

☐ **I am a Vic-20 owner and wish to delve into machine code. Could you, therefore, advise me as to the best way to go about this? I realise I need an assembler, yet how do I use it? Is that all I need? Which is the best and most reasonable assembler to buy?**

*A Jones,*
*Northwood, Merseyside.*

THE FIRST STEP is to buy a good book on learning machine code on your Vic-20. Some books actually include an assembler. Commodore sells a cartridge called Vic-Mon for programming in assembly language.

## BEST DISC DRIVE

☐ **I am planning to buy a BBC model B with disc drives, and while waiting for my savings to reach the necessary amount, I am trying to find out what is the best to buy. Buying the computer itself is not so much of a problem, but when it comes to the drives, I really cannot see the forest for the trees, and would therefore be very pleased if you could give me some advice. I am looking for at least 200K — 400K would be better still — compatibility with Acornsoft disc-based software, maximum reliability and a price-tag not exceeding the £375 mark, including cables, etc. What should I buy? If it is not possible to answer my question specifically, could you then perhaps tell me what to look for?**

*Joachim Fleury,*
*Amsterdam.*

YOU HAVE, IN fact, already gone some way to answering your own question. The advice I tend to give when asked "which . . . should I buy", be it a Pac-man implementation or a computer, is for the prospective purchaser to make a list of (a) the "must have" requirements, which usually includes the price, and particular features which are vital; and (b) the "would be nice to have" requirements. Then I suggest working through *Your Computer* magazine advertisements for a start to make a shortlist of products which meet the "must have" requirements. From this, it is usually fairly simple to find one product which also supports the "would be nice to have" list. Joining one or more machine specific users' clubs — such as Laserbug or Beebug, in your case — is also a good way to learn, at least, which products to avoid. User club publications tend to be more scathing in their treatment of unsatisfactory products than magazines aimed at a wider audience.

## INPUT INIGMA

☐ **Michael Maloney writes from Islington in north London: I was interested to see J H Weaver's letter — Response Frame, *Your Computer*, January — as I have had the same problem with the Input statement using the Microsoft Basic Compiler. The MBasic Interpreter will return a null string if Return is entered in response to the input prompt, but the compiled version prints "Redo from start" and forces re-entry on the next line. This error cannot be trapped by the On Error Goto statement and makes the Input statement useless for serious applications.**

**One way round this is to use the CP/M Bdos call for string input and I have enclosed a short 8080 routine that does this. It can be assembled with the Macro-80 assembler and incorporated in the system library — BASLIB. REL — as follows:**

```
M80 IN,IN = IN
LIB NEWLIB = BASLIB,IN,E
PIP BASLIB.REL = NEWLIB.REL
```

**Any program using it can then be compiled and linked normally.**

```
0005              bdos equ
000A              bdosfn equu
                  ;
0000'             in:
0000' E5              push  h
0001' 13              inx   d
0002' EB              xchg
0003' 5E              mov   e,m
0004' 23              inx   h
0005' 56              mov   d,m
0006' E1              pop   h
0007' E5              push  h
0008' 7E              mov   a,m
0009' 12              stax  d
000A' D5              push  d
                  ;
000B' 0E 0A           mvi   c,bdosfn
000D' CD 0005         call  bdos
                  ;
0010' D1              pop   d
0011' 13              inx   d
0012' 1A              ldax  d
0013' E1              pop   h
0014' 77              mov   m,a
                  ;
0015' C9              rel
                  ;
```

## VIC-20 UDGS

☐ **I own a Vic-20 and have written a few games for it. Since the graphics from the keyboard are not particularly exciting, I would like to know how user-defined graphics are accessed and used.**

*Mark Deaville,*
*Milton, Stoke-on-Trent.*

I AM AFRAID I cannot answer that question in a few lines. It would take an article that would run to several pages in this magazine. Creating user-defined graphics is covered in detail in the book *Beyond Simple Basic — Delving Deeper into your Vic 20* by Philip Campbell. The *Vic-20 User Guide* also covers the subject.

# SOFTWARE FILE

Software File gives you the opportunity to have your programs, ideas and discoveries published. We will accept contributions for any home computer provided they are submitted to *Your Computer* exclusively. Please double-check your programs and specify the memory they require before sending them, preferably on cassette. We pay between £6 and £36 for contributions published.

## Traffic Control

*Nick Hockaday, Shepherd's Bush, London.*

SPECTRUM

THIS PROGRAM FOR the 48K Spectrum puts you in charge of traffic in a busy city centre. It presents you with an aerial view of a number of city blocks; traffic is shown moving in all directions. Your job is to ensure a steady flow of traffic by controlling the lights at the intersections. Jams are quick to build up so you will have your work cut out. Full instructions are given in the program.

*Listing 2*

```
 5 LET t=0
10 FOR n=60000 TO 62047 STEP 8
15 PRINT n;": ";
20 FOR b=0 TO 7
25 INPUT p
30 PRINT p;" ";
40 LET t=t+p
50 POKE (n+b),p
60 NEXT b
65 PRINT
70 NEXT n
80 IF t<>197746 THEN PRINT "data
   error": STOP
90 SAVE "a"CODE 60000,2048
```

*Listing 3*

```
2 REM "tc"
4 CLEAR 59999
6 LOAD "a"CODE 60000,2048
8 LOAD "b"
```

*Listing 1*

```
  2 REM "b"
  4 PAPER 0: BORDER 0: CLS
  6 PAUSE 50: FOR n=1 TO 5: PRI
NT AT n,5; PAPER 2; BRIGHT 1;"
   ": NEXT n
  8 PAUSE 150: FOR n=8 TO 12: P
RINT AT n,5; PAPER 6; BRIGHT 1;"
     ": NEXT n
 10 PAUSE 150: CLS
 12 PAUSE 5: FOR n=15 TO 19: PR
INT AT n,5; PAPER 4; BRIGHT 1;"
    ": NEXT n
 14 PAUSE 20: BEEP .3,10: PAUS
E 10: BEEP .4,-10
 16 PRINT AT 15,13; PAPER 5;" T
RAFFIC  CONTROL "
 18 PAUSE 40: PRINT AT 17,13; P
APER 5;" Nick Hockaday    "
 20 PAUSE 40: PRINT AT 19,13; P
APER 5;" NOW PRESS ENTER  "
 22 IF INKEY$<>"" THEN GO TO 22
 24 IF INKEY$="" THEN GO TO 24
100 PAPER 5: BORDER 5: CLS
102 PRINT AT 0,9;"TRAFFIC CONTR
OL"
104 PRINT AT 1,3;"You are the c
ontroller of a"
106 PRINT "city's traffic light
s."
108 PRINT AT 3,3;"By pressing a
 key from 1 to 0"
110 PRINT "you can change the t
raffic flow"
112 PRINT "at the respective in
tersection."
114 PRINT AT 6,3;"But take care
.although cars"
116 PRINT "may sometimes enter
the car park"
118 PRINT "there are always car
s trying to"
120 PRINT "leave the car park."
122 PRINT AT 10,3;"Your job is
to ensure that"
124 PRINT "the maximum no.of ca
rs are able"
126 PRINT "to use the streets w
ithout a jam"
128 PRINT "developing.  Right t
urns are"
130 PRINT "banned throughout th
e city.  If"
132 PRINT "a car at an intersec
tion has a"
134 PRINT "go signal but is una
ble to move"
136 PRINT "forward or to the le
ft,then this"
138 PRINT "constitutes a jam.
The car will"
140 PRINT "flash and the game i
s over."
142 PRINT AT 21,9;"PRESS ENTER"
144 IF INKEY$<>"" THEN GO TO 14
4
146 IF INKEY$="" THEN GO TO 146
148 CLS : PRINT AT 0,3;"There a
re 5 levels of play."
150 PRINT AT 2,3;"Level 1 is th
e easiest,going"
152 PRINT "up to level 5,which
is the most"
154 PRINT "difficult level."
156 PRINT AT 6,3;"You will see
3 indicators on"
158 PRINT "the screen."
160 PRINT AT 8,3;"The level you
 are playing on"
162 PRINT "is at the top."
164 PRINT AT 10,3;"The number o
f cars currently"
166 PRINT "on the streets is in
dicated next"
168 PRINT "to ";TAB 3; PAPER 6;
 BRIGHT 1;"C"
170 PRINT AT 13,3;"The maximum
no.of cars that"
172 PRINT "you have had under y
our control"
174 PRINT "is shown at ";TAB 12
; PAPER 6; BRIGHT 1;"M"
176 PRINT AT 16,3;"The higher "
;TAB 14; PAPER 6; BRIGHT 1;"M"
178 PRINT AT 16,16;"is,at the e
nd of"
180 PRINT "the game,the higher
your TRAFFIC"
182 PRINT "CONTROL ability is."
184 PRINT AT 20,3;"Now press 1,
2,3,4or 5 to pick"
186 PRINT "the level you wish t
o play on."
188 IF INKEY$<>"" THEN GO TO 18
8
190 IF INKEY$="" THEN GO TO 190
192 LET l$=INKEY$: IF l$<>"1" A
ND l$<>"2" AND l$<>"3" AND l$<>"
4" AND l$<>"5" THEN GO TO 188
200 PAPER 4: BORDER 7: CLS : LE
T a=0: LET m=0: LET l=VAL l$: LE
T c$="  0": LET m$="  0"
202 IF l=1 THEN LET p=25
204 IF l=2 THEN LET p=20
206 IF l=3 THEN LET p=15
208 IF l=4 THEN LET p=10
210 IF l=5 THEN LET p=5
212 POKE 60000,0: POKE 60001,0:
 POKE 60002,0: POKE 60003,0: POK
E 60004,0: POKE 60005,1
214 FOR n=60658 TO 60694 STEP 4
216 LET x=(PEEK n)/2
218 IF x=INT x THEN POKE n,2*x+
1
220 NEXT n
222 RANDOMIZE USR 60025
224 PRINT AT 0,7; PAPER 6;" CAR
 PARK ": PRINT AT 0,21; PAPER 6;
"LEVEL"
226 PRINT AT 1,23; PAPER 6;l
228 PRINT AT 2,2; PAPER 6; BRIG
HT 1;"1": PRINT AT 2,10; PAPER 6
; BRIGHT 1;"2": PRINT AT 2,18; P
APER 6; BRIGHT 1;"3": PRINT AT 2
,26; PAPER 6; BRIGHT 1;"4"
230 PRINT AT 7,14; PAPER 6; BRI
GHT 1;"M";: PRINT TAB 15; PAPER
5; BRIGHT 1;m$: PRINT AT 7,22; P
APER 6; BRIGHT 1;"C";: PRINT TAB
 23; PAPER 5; BRIGHT 1;c$
232 PRINT AT 9,2; PAPER 6; BRIG
HT 1;"5": PRINT AT 9,8; PAPER 6;
"FLY OVER": PRINT AT 9,18; PAPER
 6; BRIGHT 1;"6": PRINT AT 9,26;
 PAPER 6; BRIGHT 1;"7"
234 PRINT AT 12,8; PAPER 6;"FLY
 OVER"
236 PRINT AT 16,2; PAPER 6; BRI
GHT 1;"8": PRINT AT 16,10; PAPER
 6; BRIGHT 1;"9": PRINT AT 16,26
; PAPER 6; BRIGHT 1;"0"
238 PRINT AT 17,9; INK 7;"Nick"
: PRINT AT 18,9; INK 7;"Hocka-":
 PRINT AT 19,9; INK 7;"day": PRI
NT AT 20,11; INK 7;"1984"
300 IF INKEY$<>"" THEN LET a=1
302 LET x=USR 60189
304 IF PEEK 60004=0 THEN GO TO
350
306 POKE x,248: BEEP .75,7: BEE
P .25,8: BEEP .5,7: BEEP .5,5: B
EEP .5,3: BEEP .5,2: BEEP 1,0
308 PRINT AT 7,14; PAPER 6; BRI
GHT 1; FLASH 1;"M"
310 PRINT AT 9,6; PAPER 7;" GAM
E  OVER ": PRINT AT 10,6; PAPER
7;"              ": PRINT AT 11,6;
 PAPER 7;"FOR NEW GAME": PRINT A
T 12,6; PAPER 7;"  PRESS  Z  "
312 IF INKEY$<>"" THEN GO TO 31
2
314 IF INKEY$="" THEN GO TO 314
316 LET l$=INKEY$: IF l$<>"z" T
HEN GO TO 312
318 GO TO 100
350 IF a=1 THEN BEEP .05,m/2: L
ET a=0
352 FOR n=1 TO p: NEXT n
354 RANDOMIZE USR 60464
356 GO SUB 600
400 FOR n=1 TO p: NEXT n
402 RANDOMIZE USR 60538
404 GO SUB 600
450 FOR n=1 TO p: NEXT n
452 GO TO 300
600 LET c=PEEK 60000+256*PEEK 6
0001
602 LET m=PEEK 60002+256*PEEK 6
0003
604 LET c$=STR$ c: LET m$=STR$
m
606 IF LEN c$<3 THEN LET c$=" "
+c$: GO TO 606
608 IF LEN m$<3 THEN LET m$=" "
+m$: GO TO 608
610 PRINT AT 7,15; PAPER 5;m$:
PRINT AT 7,23; PAPER 5;c$
612 RETURN
```

```
60000: 152 4 152 4 0 1 32 1
60008: 35 67 98 64 2 35 98 97
60016: 64 1 2 98 35 97 1 64
60024: 0 221 33 241 236 221 126 0
60032: 254 0 40 81 221 110 2 221
60040: 102 3 35 35 221 126 1 230
60048: 192 229 205 87 242 225 1 30
60056: 0 9 229 205 87 242 225 1
60064: 35 0 9 229 205 87 242 225
60072: 1 30 0 9 229 205 87 242
60080: 225 1 97 0 167 237 66 229
60088: 1 33 0 9 54 40 35 54
60096: 40 1 31 0 9 54 40 35
60104: 54 40 225 205 231 241 1 4
60112: 0 221 9 24 168 221 110 1
60120: 221 102 2 221 126 3 205 87
60128: 242 1 4 0 221 9 221 126
60136: 1 254 0 40 19 221 110 0
60144: 221 102 1 221 126 4 205 87
60152: 242 1 5 0 221 9 24 230
60160: 221 35 221 35 221 126 1 254
60168: 0 200 221 110 0 221 102 1
60176: 221 126 6 205 87 242 1 7
60184: 0 221 9 24 231 221 33 241
60192: 236 221 126 0 254 0 40 56
60200: 58 4 92 221 190 0 40 7
60208: 1 4 0 221 9 24 234 221
60216: 110 2 221 102 3 221 126 1
60224: 230 1 254 0 40 14 221 126
60232: 1 230 192 205 36 242 221 203
60240: 1 134 24 12 221 126 1 230
60248: 192 205 231 241 221 203 1 198
60256: 221 33 241 236 221 126 0 254
60264: 0 200 0 0 221 110 2 221
60272: 102 3 17 6 0 221 126 1
60280: 230 1 254 0 40 3 17 0
60288: 0 221 229 221 33 102 234 221
60296: 25 221 126 0 50 114 234 221
60304: 126 3 50 117 234 58 120 92
60312: 203 71 40 14 221 126 1 50
60320: 115 234 221 126 2 50 116 234
60328: 24 12 221 126 1 50 116 234
60336: 221 126 2 50 115 234 58 120
60344: 92 203 71 40 14 221 126 4
60352: 50 118 234 221 126 5 50 119
60360: 234 24 12 221 126 4 50 119
60368: 234 221 126 5 50 118 234 221
60376: 33 114 234 221 126 0 254 0
60384: 40 63 221 94 0 22 0 227
60392: 25 68 77 126 254 40 32 38
60400: 225 229 221 94 1 22 0 25
60408: 126 254 40 40 7 54 40 62
60416: 45 2 24 18 225 229 221 94
60424: 2 22 0 25 126 254 40 40
60432: 23 54 40 62 45 2 225 1
60440: 3 0 221 9 24 189 221 225
60448: 1 4 0 221 9 195 100 235
60456: 225 225 33 100 234 54 1 201
60464: 221 33 25 237 221 110 1 221
60472: 102 2 126 254 40 32 9 54
60480: 45 42 96 234 43 34 96 234
60488: 1 4 0 221 9 221 126 1
60496: 254 0 200 0 221 110 0 221
60504: 102 1 126 254 40 32 13 229
60512: 221 110 2 221 102 3 126 254
60520: 40 32 8 225 1 5 0 221
60528: 9 24 218 54 40 225 54 45
60536: 24 242 221 33 157 241 221 126
60544: 1 254 0 40 66 221 110 0
60552: 221 102 1 221 78 2 221 70
60560: 3 221 94 4 221 86 5 126
60568: 254 40 32 36 58 120 92 203
60576: 71 40 5 10 254 40 32 18
60584: 26 254 40 40 8 54 45 213
60592: 225 54 40 24 11 10 254 40
60600: 40 6 54 45 197 225 54 40
60608: 1 7 0 221 9 24 183 221
60616: 110 2 221 102 3 126 254 40
60624: 40 25 54 40 42 96 234 35
60632: 34 96 234 237 75 98 234 167
60640: 237 66 250 238 234 42 96 234
60648: 34 98 234 33 100 234 54 0
60656: 201 48 129 26 90 49 1 66
60664: 88 50 0 74 88 51 1 82
60672: 38 52 1 90 88 53 65 34
60680: 39 54 65 50 89 55 65 58
60688: 39 56 129 2 90 57 128 18
60696: 90 0 43 88 0 44 88 76
60704: 88 0 75 88 43 88 0 203
60712: 88 171 88 0 59 90 50 90
60720: 128 70 90 69 90 128 234 89
60728: 235 89 64 15 90 47 90 128
60736: 104 90 72 90 128 105 88 106
60744: 88 0 142 88 141 88 0 134
60752: 88 133 88 0 113 88 114 88
60760: 0 36 88 68 88 0 52 88
60768: 84 88 0 60 88 92 88 0
60776: 97 88 98 88 0 195 88 163
60784: 88 0 150 88 149 88 0 171
60792: 88 122 88 0 158 88 157 88
60800: 0 219 88 187 88 0 211 88
60808: 179 88 0 4 89 36 89 64
60816: 20 89 52 89 64 28 89 60
60824: 89 64 60 89 64 89 64 81
60832: 89 82 89 64 89 89 90 89
60840: 64 102 89 101 89 64 118 89
60848: 117 89 64 126 89 125 89 64
60856: 163 89 131 89 64 179 89 147
60864: 89 64 187 89 155 89 64 228
60872: 89 4 90 64 244 89 20 90
60880: 64 252 89 28 90 64 33 90
60888: 34 90 128 86 90 85 90 128
60896: 57 90 50 90 150 94 90 93
60904: 90 128 131 90 99 90 128 147
60912: 90 115 90 128 155 90 123 90
60920: 128 235 88 203 88 0 48 90
60928: 49 90 128 71 90 70 90 128
60936: 233 89 234 89 64 239 89 15
60944: 90 64 136 90 104 90 128 104
60952: 88 105 88 0 143 88 142 88
60960: 0 135 88 134 88 0 112 88
60968: 113 88 0 4 88 36 88 0
60976: 20 88 52 88 0 28 88 60
60984: 88 0 96 88 97 88 0 227
60992: 88 195 88 0 151 88 150 88
61000: 0 120 88 121 88 0 155 88
61008: 156 88 0 251 88 219 88 0
61016: 243 88 211 88 0 228 88 4
61024: 89 0 244 88 20 89 0 252
61032: 88 28 89 0 64 89 65 89
61040: 64 80 89 81 89 64 79 89
61048: 80 89 64 88 89 89 89 64
61056: 103 89 102 89 64 104 89 103
61064: 89 64 119 89 118 89 64 127
61072: 89 126 89 64 195 89 163 89
61080: 64 211 89 179 89 64 219 89
61088: 187 89 64 196 89 228 89 64
61096: 212 89 244 89 64 220 89 252
61104: 89 64 32 90 33 90 128 238
61112: 89 238 89 64 237 89 270 89
61120: 64 87 90 86 90 128 56 90
61128: 57 90 128 78 89 79 89 64
61136: 105 89 104 89 64 95 90 94
61144: 90 128 168 90 136 90 128 169
61152: 90 166 90 128 163 90 131 90
61160: 128 236 89 237 89 64 179 90
61168: 147 90 128 187 90 155 90 128
61176: 170 90 169 90 128 164 90 4
61184: 88 128 186 90 70 88 128 11
61192: 89 235 88 64 188 90 28 88
61200: 128 3 88 163 90 0 232 89
61208: 233 89 64 19 88 179 90 0
61216: 171 90 170 90 128 27 88 187
61224: 90 0 128 88 159 88 0 127
61232: 88 96 88 0 77 89 78 89
61240: 64 106 89 105 89 64 204 89
61248: 236 89 64 95 89 64 89 64
61256: 96 89 127 89 64 76 89 77
61264: 89 64 107 89 106 89 64 171
61272: 89 11 89 64 8 90 237 89
61280: 128 64 90 95 90 128 63 90
61288: 32 90 128 172 90 171 90 128
61296: 172 89 204 89 64 40 70 0
61304: 90 128 35 88 3 88 0 51
61312: 88 19 88 0 59 88 27 88
61320: 0 75 89 76 89 64 108 89
61328: 107 89 64 129 88 120 88 0
61336: 103 88 104 88 0 136 88 135
61344: 88 0 111 88 112 88 0 144
61352: 88 143 88 0 119 88 120 88
61360: 0 152 88 151 88 0 126 88
61368: 127 88 0 203 89 171 89 64
61376: 173 90 172 90 128 55 90 56
61384: 90 128 88 90 87 90 128 132
61392: 90 164 90 128 12 89 172 89
61400: 64 102 88 103 88 0 110 88
61408: 111 88 0 118 88 119 88 0
61416: 137 88 136 88 0 145 88 144
61424: 88 0 153 88 152 88 0 74
61432: 89 75 89 64 109 89 108 89
61440: 64 174 90 173 90 128 148 90
61448: 160 90 128 156 90 188 90 128
61456: 35 90 40 90 128 87 89 88
61464: 89 64 120 89 119 89 64 27
61472: 89 251 88 64 220 88 252 88
61480: 0 94 89 93 89 64 3 89
61488: 227 88 64 196 88 228 88 0
61496: 15 89 243 88 64 212 88 244
61504: 88 0 175 90 174 90 128 227
61512: 89 195 89 64 164 89 196 89
61520: 64 243 89 211 89 64 143 90
```

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```
61520: 175 90 128 180 89 212 89 64
61536: 251 89 219 89 54 108 89 220
61544: 89 64 67 88 35 88 0 236
61552: 88 12 89 0 111 90 143 90
61560: 128 83 88 51 88 0 91 88
61568: 59 88 0 38 90 39 90 128
61576: 97 89 96 89 64 130 88 129
61584: 88 0 125 88 126 88 0 86
61592: 89 87 89 67 73 89 74 89
61600: 64 110 89 109 89 64 121 89
61608: 120 89 64 65 90 64 90 128
61616: 101 88 102 88 0 72 89 73
61624: 89 64 111 89 110 89 64 164
61632: 88 196 88 0 109 88 110 88

61640: 0 79 90 111 90 120 71 89
61648: 72 89 64 112 89 111 89 64
61656: 138 88 137 88 0 204 88 236
61664: 88 0 146 88 145 88 0 117
61672: 88 118 88 0 180 88 212 88
61680: 0 80 90 79 90 128 154 88
61688: 153 88 0 54 90 55 90 128
61696: 89 90 88 90 128 70 89 71
61704: 89 64 113 89 112 89 64 100
61712: 88 250 88 0 177 88 204 88
61720: 0 35 89 3 89 64 132 89
61728: 164 89 64 98 89 97 89 64
61736: 81 90 80 90 128 51 89 19
61744: 89 64 148 89 180 89 64 85
61752: 89 88 89 64 114 89 113 89
61760: 64 55 89 27 89 64 93 89
61768: 94 89 64 156 89 188 89 64

61776: 122 89 121 89 64 62 90 63
61784: 90 128 69 89 70 89 64 3
61792: 90 227 89 128 100 90 132 90
61800: 128 66 90 65 90 128 37 90
61808: 38 90 128 116 90 148 90 128
61816: 19 90 213 89 128 82 90 81
61824: 90 128 53 90 54 90 128 124
61832: 90 156 90 128 27 90 251 89
61840: 128 90 90 89 90 128 61 90
61848: 62 90 128 0 0 72 90 71
61856: 90 40 90 128 47 90 48 90
61864: 79 90 128 235 89 203 89 236
61872: 89 64 0 0 44 88 254 123
61880: 40 4 254 64 40 5 17 0
61888: 24 24 8 17 0 17 24 3
61896: 17 0 10 167 237 82 201 54
61904: 0 36 54 0 36 54 60 36

61912: 54 60 36 54 60 36 54 60
61920: 36 54 0 36 54 0 201 1
61928: 33 0 9 205 182 241 229 62
61936: 7 54 0 36 61 32 250 54
61944: 255 225 35 229 62 7 54 0
61952: 36 61 32 250 54 255 225 11
61960: 11 9 229 54 255 36 62 7
61968: 54 0 36 61 32 250 225 35
61976: 54 255 36 62 7 54 0 36
61984: 61 32 250 201 1 33 0 9
61992: 205 182 241 229 62 8 54 1
62000: 36 61 32 250 225 35 229 62
62008: 8 54 128 36 61 32 250 225
62016: 11 11 9 229 62 8 54 1
62024: 36 61 32 250 225 35 62 8
62032: 54 128 36 61 32 250 201 54
62040: 45 205 182 241 205 207 241 201
```

# Stuntman

BBC

*S. Bradshaw*

STUNTMAN IS A GAME where you become a stuntman and you have to jump over cars on a motorbike.

Your motorbike starts off in the top left corner of the screen and you control its speed across and down the screen. There are six levels on each screen with a jump with varying numbers of cars on each. It does not matter if you jump too far over the cars, unless there is a tunnel after a jump. After the jumps with tunnels you must land just after the cars in order to go straight through the tunnel.

You start with three motorbikes and lose one every time you crash, and the game ends when you have none left. You score five points for every jump and a bonus for finishing each screen. There is also an extra bonus for of a hundred points for finishing five screens.

The program takes up about 3.4K but it uses Mode 1 which uses 20K. The program was written for the model B but it could easily be converted to run on Model A in Mode 4. The instructions procedure is unimportant and could be missed out or changed. To omit the procedure delete lines 60, 540 and 550, change line 520 and change line 530 to

REPEAT UNTIL INKEY ( – 99):CLS

```
    1 REM * S T U N T M A N *
    2 REM *  By S.Bradshaw  *
   10 MODE1
   20 VDU23,230,12,60,120,254,50,239,181,231,23,231,0,
0,0,0,0,0.48,48,23,232,60,114,127,245,119,240,160,224
   30 VDU23,233,0,3,7,15,31,63,127,255,23,234,7,3,8,31
,51,63,48,48,23,235,224,16,16,248,204,252,12,12
   40 VDU23,236,0,0,0,170,255,255,129,66,23,237,36,24,
36,66,129,255,255,170,23,238,48,49,254,50,47,173,119,E
B
   50 VDU23;8202;0;0;0;
   60 PROCINST
   70 CLS:VDU19,2,2;0;19,3,6;0;5
   80 SC%=0:HSC%=100:HSC$="WILD WILLY":L%=1:M%=3:H%=0:
DIMR%(6)
   90 PROCSET
  100 GCOL3,3:MOVE32,832:PRINTB$
  110 REPEAT:PROCTUNE:TIME=0:REPEAT
  120 G%=50-TIME DIV150
  130 IFG%<0 G%=0
  140 PROCM
  150 PROCSC
  160 UNTILM%=0
  170 PROCEND
  180 VDU5:PROCSET
  190 UNTILFALSE
  200 DEFPROCM
  210 GCOL3,3:MOVEX%,Y%:PRINTB$
  220 P%=POINT(X%+16,Y%-36)
  230 IFINKEY(-74)ANDS%<58ANDP%>0 S%=S%+1
  240 IFINKEY(-1)ANDS%>0ANDP%>0 S%=S%-1
  250 X%=X%+S%DIV2:IFX%>1280 Y%=Y%-160:X%=-32:SC%=SC%+
5
  260 C%=((Y%-32)DIV160)+1
  270 IFX%>(R%(C%)-32)ANDX%<R%(C%)ANDP%>0 Y%=Y%+32:X%=
X%+E%:J%=1
  280 IFJ%=1ANDS%>47 PROCCRASH
  290 IFJ%=1 B%=B%+1:Y%=Y%+(S%/5):B$=J$
  300 IFB%>5 B%=0:J%=0
  310 IFP%=2 PROCCRASH
  320 SOUND1,0,S%+3,0:SOUND0,-10-S%/10,3,2
  330 IFY%<0 CLS:SC%=SC%+G%:L%=L%+1:PROCSET:TIME=0
  340 IFP%=0 Y%=Y%-4ELSEB$=F$
  350 IFS%>47 B$=C$
  360 GCOL3,3:MOVEX%,Y%:PRINTB$
  370 ENDPROC
  380 DEFPROCSC
  390 VDU4:PRINTTAB(4,2);SC%;TAB(13,2);L%;TAB(20,2);G%
;" ";TAB(28,2);S%;" ";TAB(36,2);M%;" ":VDU5
  400 ENDPROC
  410 DEFPROCCRASH
  420 GCOL3,3:MOVEX%,Y%:PRINTCHR$238
  430 SOUND0,-15,5,10
  440 FORDEL=0TO800:NEXTDEL:MOVEX%,Y%:PRINTCHR$238
  450 H%=H%-1:PROCSET:TIME=0:M%=M%-1
  460 ENDPROC
  470 DEFPROCEND:VDU4:CLS
  480 *FX15,0
  490 IFSC%>HSC% HSC%=SC%:PRINTTAB(3,5);"You beat the
high score.";TAB(3,7);"What is your name?":INPUTHSC$:C
LS
  500 PRINTTAB(5,4);"HIGH SCORE="HSC%;TAB(5,5);"HIGHSC
ORER=";HSC$
  510 PRINTTAB(5,7);"YOUR SCORE WAS ";SC%
  520 PRINTTAB(4,12);"PRESS SPACE TO START AGAIN OR I
FOR      INSTRUCTIONS"
  530 REPEATUNTILINKEY(-99)OR INKEY(-38)
  540 IFINKEY(-38)PROCINST
  550 IFINKEY(-99)CLS
  560 VDU5:GCOL3,3:MOVEX%,Y%:PRINTCHR$230
  570 SC%=0:L%=1:M%=3:H%=0:ENDPROC
  580 DEFPROCINST:CLS
  590 COLOUR1
  600 PRINTTAB(12,3);"S T U N T M A N":TAB(11,4);STRIN
G$(17,"~")
  610 COLOUR2
  620 PRINTTAB(2,7);"You have recently gained employme
nt as a stuntman and your first task in this  new job
is to jump cars on a moto-bike."
  630 PRINTTAB(2,10);"This game represents your job wh
ere  you  control the bike to jump the cars. The bike
 starts off in the top left     corner and you control
 its speed across and down the screen."
  640 PRINTTAB(2,16);"To accelerate use RETURN and to
brake use SHIFT.You can accelerate to 58mph   but you
can not hit a ramp travelling   faster than 47mph.When
 you finish the   screen you get a bonus which gradual
y   decreases during the"
  650 PRINTTAB(21,21);"game.After some    jumps there
will be a tunnel which you  must go through.There are
five differentsets of ramps to jump and you get a
bonus for finishing them all."
  660 PRINTTAB(2, 28);"Press space to start.":REPEATUN
TILINKEY(-99)
  670 CLS:ENDPROC
  680 DEFPROCSET
  690 H%=H%+1:IFH%>5 H%=1:SC%=SC%-100:PROCTUNE
  700 VDU4:PRINTTAB(3,1);"SCORE   LEVEL   BONUS   SPEE
D    ";CHR$230:VDU5
  710 X%=32:Y%=832:S%=0:J%=0:B%=0:F$=CHR$230
  720 J$=CHR$232+CHR$8-CHR$11+CHR$231
  730 B$=F$:T$=CHR$237-CHR$237+CHR$8+CHR$8+CHR$11+CHR$
236+CHR$236
  740 IFH%=1RESTORE850 ELSEIFH%=2RESTORE860 ELSEIFH%=3
RESTORE870 ELSEIFH%=4RESTORE880 ELSEIFH%=5RESTORE890
  750 GCOL0,1:FORA%=0TO800STEP160
  760 C%=(A%DIV160)+1
  770 READD%,E%,F%
  780 R%(C%)=E%-32
  790 MOVER%(C%),A%+32:PRINTCHR$233
  800 GCOL0,2:MOVEE%,A%+32:PRINTSTRING$(D%,CHR$234+CHR
$235)
  810 IFF%=1 MOVEE%+(D%*64)+200,A%+32:PRINTT$
  820 GCOL0,1
  830 MOVE0,A%:DRAW1280,A%:MOVE0,A%-4:DRAW1280,A%-4:NE
XT
  840 ENDPROC
  850 DATA2,70,0,4,400,1,4,150,0,3,500,1,2,700,0,1,300
,0
  860 DATA4,200,0,2,100,1,4,600,1,3,300,1,3,800,0,4,55
0,1
  870 DATA1,100,1,3,600,1,5,300,0,2,300,1,4,100,1,3,80
0,1
  880 DATA1,900,1,5,200,0,2,100,1,3,700,1,1,200,1,3,90
0,1
  890 DATA4,200,1,3,900,0,5,100,1,2,400,1,4,100,0,1,95
0,1
  900 DEFPROCTUNE:RESTORE950
  910 FORSO=1TO22:READA,B
  920 SOUND1,-15,A,B
  930 SOUND1,0,0,B:NEXT
  940 ENDPROC
  950 DATA20,1,20,2,40,1,60,1,40,1,60,1,40,1,30,1,30,2
,50,1,70,4,80,1,60,1,40,1,80,1,60,1,40,1,60,1,80,1,100
,2,30,1,100,6
```

# SOFTWARE FILE

## 3D-Effect

*Chris Cattanach,*
*Welwyn,*
*Hertfordshire.*

VIC-20

THIS PROGRAM WAS written on an expanded Vic-20 — 16K — and features the spinning outline of a 2 inch cube, depicted in outline as a wire skeleton, so all the edges are seen simultaneously.

Written in machine code, the program rapidly projects successive images of the cube in 3D on the screen, giving the illusion of movement. The speed of rotation may be slowed down, or increased with the aid of the function buttons F1 and F7.

As regular users of an expanded Vic-20 will know, the presence of the extra 16K brings about a rearrangement of the various memory locations, including that of the screen. Before this program can be Run, it is necessary to set aside an area where one can store the machine code, without fear of it being overrun with Basic. This is done by running the short program entitled "Re-arrange Vic-memory" every time the computer is first switched on. This moves the start of Basic to 8192, and reserves the section from 4096 to 7679 for machine code.

As described in the Commodore Programmers' Reference book, the screen address has now been moved to 7680. This program should be saved for future use, before being Run. After being Run, it is automatically erased from memory, having done its job.

When the Basic program is first Run, the lines 2000-2015 Poke the Data values into the area reserved for machine code. Data values in Lines 20-28; 29-35; 36-44 and 45-52 contain information essential for drawing the various shapes of the cube. Data values in Lines 1000 to 1005 are concerned with the machine code control program.

The program is directed to the machine-code program by the various SYS values in List 4001. Once the Control part of the machine-code program has been invoked, this loads the various line values into the accumulator and Stores them in the relevant positions. Lines 4005-4012 control the speed of rotation.

It is very important to Save the program, before RUNing it, in case errors have been introduced and it crashes. Nothing is more frustrating than to spend some time typing in a lot of values and then losing the lot.

For those not interested in machine code, the Basic program supplied will set up all the parameters and the program will Run without trouble. For machine code enthusiasts, further information is supplied by the "Disassembler Analysis of Rotation Control" print out. The Control part of the machine-code program which lies between 6000-6090 decimal (1770-17D2 Hex) has been analysed by a disassembler program.

**ROTATION BY MACHINE CODE (VIC-20)**

```
0REM"ROTFTICN BY MACHINE CODE - 3D EFFECT"
2 REM BY C.J.CATTANACH
3 PRINT"PRESS ANY BUTTON - WAIT 4 SECS"
4 GETO$:IFO$=""THEN4
20 DATA141,163,30,141,167,30,141,186,30,141,190,30,141,61,31,141,65,31,141,84,31
,141
21 DATA88,31,96,141,212,30,141,211,30,141,64,31,96
22 DATA141,142,30,141,39,31,141,40,31,141,143,30,141,187,30,141,188,30,141,144,3
0
23 DATA141,141,30,96,141,19,31,141,23,31,141,189,30,141,209,30,141,85,31,141,41,
31
24 DATA141,1,31,141,89,31,141,231,30,141,45,31,141,213,30,141,63,31,141,235,30
25 DATA141,67,31,141,253,30,96
26 DATA141,232,30,141,210,30,141,42,31,141,250,30,141,166,30,141,254,30,141,162,
30
27 DATA141,16,31,141,206,30,141,20,31,141,228,30,141,38,31,141,184,30,96
28 DATA141,107,31,141,108,31,141,109,31,141,110,31,96
29 REM FIG 2
30 DATA141,44,31,141,163,30,141,232,30,141,252,30,141,121,30,141,17,31,141,21,,3
0
31 DATA141,65,31,141,142,30,141,86,31,141,190,30,96
32 DATA141,22,31,141,254,30,141,42,31,141,213,30,141,1,31,141,64,31,141,235,30,1
41,20,31
33 DATA141,191,30,96,141,250,30,141,209,30,141,187,30,141,143,30,141,223,30,141,
16,31
34 DATA141,184,30,141,206,30,141,165,30,96,141,122,30,141,145,30,141,168,30,141,
185,30
35 DATA141,208,30,141,231,30,141,255,30,141,22,31,141,39,31,141,62,31,141,85,31,
96
36 REM FIG 3
37 DATA141,164,30,141,168,30,141,165,30,141,189,30,141,62,31,141,66,31,141,83,31
38 DATA141,87,31,96,141,207,30,141,63,31,141,208,30,141,209,30,141,210,30,141,10
5,31
39 DATA141,106,31,141,107,31,141,108,31,96,141,146,30,141,42,31,141,44,31,141,14
5,30
40 DATA141,144,30,141,145,30,96,141,23,31,141,165,30,141,43,31,141,187,30,141,45
,31
41 DATA141,169,30,141,191,30,141,65,31,141,211,30,141,213,30,141,233,30,141,235,
30
42 DATA141,255,30,141,1,31,96
43 DATA141,18,31,141,228,30,141,250,30,141,38,31,141,82,31,141,40,31,141,86,31
44 DATA141,252,30,141,230,30,141,206,30,141,16,31,141,60,31,96
45 REM FIG 4
46 DATA141,62,31,141,63,31,141,64,31,141,65,31,141,164,30,141,165,30,141,166,30
47 DATA141,167,30,95,141,234,30,141,0,31,141,66,31,141,88,31,141,22,31,141,44,31
48 DATA141,190,30,141,212,30,96
49 DATA141,229,30,141,39,31,141,83,31,141,207,30,141,61,31,141,251,30,141,185,30
50 DATA141,17,31,96
51 DATA141,208,30,141,209,30,141,210,30,141,211,30,141,106,31,141,107,31
52 DATA141,108,31,141,109,31,96
1000 DATA169,77,32,30,16,169,99,32,25,16,169,100,32,35,16,169,101,32,60,16
1001 DATA169,103,32,106,16,169,99,32,146,16,96
1002 DATA169,78,32,159,16,169,101,32,193,16,169,103,32,221,16,169,77,32,249,16,9
6
1003 DATA169,78,32,27,17,169,99,32,52,17,169,100,32,80,17,169,101,32,99,17,169,1
03,32
1004 DATA142,17,96
1005 DATA169,100,32,179,17,169,101,32,204,17,169,103,32,229,17,169,99,32,254,17,
96
2000 FORL=4096TO4630
2001 READA:POKEL,A
2004 NEXT
2010 FORL=6000TO6093
2011 READA:POKEL,A
2015 NEXT
2016 PRINT"CF1 FASTER: F2 SLOWER. PRESS ANY BUTTON"
2017 GETH$:IFH$=""THEN2017
4000 M=100:POKE36879,8:PRINT"C"
4001 SYS6000:GOSUB4005:SYS6031:GOSUB4005:SYS6052:GOSUB4005:SYS6073:GOSUB4005:GOT
O4001
4005 FORT=1TOM:NEXT
4008 GETJ$:IFJ$="■"THENM=M-10
4009 IFJ$="■"THENM=M+10
4010 IFM<=0THENM=20
4012 PRINT"C":RETURN
4020 STOP
```

**RE-ARRANGE VIC-MEMORY**

```
2 REM"RE-ARRANGE VIC-MEMORY"
10 POKE648,30:POKE36866,150:POKE641,0
   :POKE642,32:POKE36869,240
40 POKE43,1:POKE44,32
50 POKE8192,0
60 PRINT"C":NEW
```

## Listing speed

*S.A. Sassoon,*
*Long Stratton,*
*Norfolk.*

CBM-64

THE COMMODORE 64 lists at such a fast speed that it is impossible to read each line as it scrolls onto the screen, even while the Ctrl key is held down. This routine enables the function keys to control the listing speed.

Once the program has been run, holding down the f1 key while a program is being listed halts the display, enabling the lines to be examined. Holding down the f3 key during listing causes the display to be slowed down — characters being printed on the screen one at a time.

*(continued on next page)*

(continued from previous page)

This is extremely useful for checking complicated Basic lines such as data statements. As an extra bonus, it will also reveal any Basic lines that have been hidden with delete characters.

The speed of the slow listing depends on the value Poked in line 30. This can be altered if required — values of 230 to 255 give best results.

This extension to the Basic list routine is written in machine code which is Poked into memory from the data statements. This means that after running it can be newed and the listing controls remain effective on any further programs which are entered or loaded.

```
10 REM  PRESS F1 TO PAUSE LISTING, PRESS
  F3 TO SLOW LISTING SPEED
20 :
30 POKE 251,248 :REM SPEED OF LISTING
  (230-255 GIVE BEST RESULTS)
40 FOR D=0 TO 22 :READ MCODE :POKE 49152
 +D,MCODE :NEXT
50 POKE 774,0 :POKE 775,192  :REM ALTER
  LIST VECTOR TO EXECUTE NEW CODE
60 DATA 72,165,197,201,4,240,250,201,5
70 DATA 208,8,165,251,133,162,165,162,48
 ,252,104,76,26,167
```

# Screen Editor

R.G. Strange,
Loughborough,
Leicestershire.

DRAGON

THIS PROGRAM EQUIPS the Dragon with a screen editor, a valuable programming aid with many uses including modification of the program line sequence and line concatenation.

The machine code is relocatable and uses the character-input RAM hook at address $16A.

```
0 CLS7:MOTOR ON
20 PRINT@36,"DRAGON 32 SCREEN EDITOR";
30 PRINT@129,"RIGHT ARROW INVOKES EDITOR    ";
40 PRINT@193,"'^' IS NOW ACCESSED BY SHIFT ^";
50 PRINT@257,"USE SHIFT "CHR$(95)" TO DELETE       "
;
60 CLEAR200,32595
70 FOR A=32596 TO 32767:READ D$:D=VAL("&H"+D$):CS=CS+D
:POKEA,D:NEXT
80 IF CS<>15975 THEN PRINT@321,"ERROR IN PROGRAM":END
ELSE PRINT@353,"SCREEN EDITOR IS INSTALLED    ";:PRINT
@448,"";
90 EXEC 32596:SOUND200,1
100 DATA30,8C,B,BF,1,6B,86,7E,B7,1,6A,F,FF,39,D,6F,26,
FB,D,FF,26,6,81,9,26,F3,3,FF,32,62,34,34,F,70,8D
110 DATA50,BD,80,6,26,4,F,FE,20,F7,8E,1,51,C6,FF,E7,80
,8C,1,5A,26,F9,8E,20,0,30,1F,26,FC,C,FE,D6,FE,C4,FE
120 DATA27,4,C1,6,25,D8,12,12,8D,24,81,9,27,2F,81,8,27
,2D,81,5E,27,21,81,A,27,20,81,C,27,31,81,5F,27,41,81
130 DATA15,27,3B,81,D,26,2,F,FF,35,B4,9E,88,E6,84,C8,4
0,E7,84,39,30,88,C0,30,88,1F,30,2,30,1F,8C,4,0,25,7
140 DATA8C,5,FF,22,2,9F,88,20,8B,A6,84,81,20,24,4,8D,6
0,35,B4,81,60,25,2,80,40,35,B4,86,9,4A,35,B4
```

Type in the program and save it in case of a crash, then run it. Line 80 provides a checksum which should detect most errors in the data. When all is correct, the Exec statement in line 90 sets up the RAM hook. Once the program is debugged, you can add a New command to line 90 so that the program clears itself.

The editor is installed now but it is not active, and the Dragon behaves just like normal, though you cannot use the right-arrow in your programs. To invoke the editor, press the right-arrow key, whereupon the cursor should stop blinking. Using the arrow keys, the cursor can be positioned anywhere on the screen. Note that the keyboard auto-repeats if a key is held down.

Once the cursor has been placed over the first of a set of characters to be copied, pressing the Clear key will run the cursor along the line, copying the characters as if they had been typed. Characters may be inserted by moving the cursor off the line, typing the new characters and moving back onto the line.

The up-arrow character may be obtained using shift up-arrow. To delete a character once it has been copied, type shift left-arrow. Once the new line is complete, it can be entered by typing Return as usual. This also exits from the editor.

# Back-up

D N Venamore,
Burgess Hill,
Sussex.

ZX-81

THIS COPIER for the 16K ZX-81 will duplicate any program up to 15K long including those which cannot be Saved by the normal routine.

The program is a modified version of the ZX-81 Load and Save routines and comprises 128 bytes of machine code and a supporting "no-frills" Basic program. It fits into 1K with a little to spare.

The program to be copied is loaded above RAMtop, from where it can be saved as required.

Before typing in anything,

POKE 16389,72

and New. This sets RAMtop to 18432, which allows sufficient space to enter and edit the program, but is low enough to collapse the Display File. If this is not done the expanded Display File will be saved with your completed program, making it too long to Load into the 1K finally allocated for it.

Load or type in your favourite hex loader and create a Line 1 Rem statement with 128 characters of your choice.

If your hex loader starts at Line 10,

POKE 16419,10

If not create a dummy Line 10 — 10 Rem will do — and then

POKE 16419,10

Load the machine code — listing 1 — into the Rem statement and check it. Note that the first two bytes of machine code prevent the rest of the machine code listing in the Rem statement.

When the machine code is loaded in,

POKE 16510,10

The Rem statement should now be Line 0. This cannot be accidently deleted.

Now delete all lines excepting Line 0 and 10, and enter the remainder of the program — listing 2 — overwriting the previous line 10.

Save the program a couple of times before proceeding.

The program in the computer cannot be Run in its present state because RAMtop is too high.

It is necessary then to clear the program from memory, reset RAMtop to 17408 and reload the program.

I prefer to set RAMtop using the short program in listing 3.

I keep this on tape in front of the Copy program with approx. 10 secs of tape running between them.

Whichever you prefer, enter New. Set RAMtop using the RAMtop program or

POKE 16389,68

Now reload Copy and run it.

The first prompt asks for the name of the program to be copied. Note that the name is not used to find the named program on the tape.

After entering the name and Newline, the next prompt appears, "Start Tape the New Line".

Audibly monitor the program to be copied and locate the start of the 5 second silent period which precedes the program proper. Stop the tape there. Then with the recorder set for Load, start the tape and press Newline immediately.

When the program is Loaded, the prompt

"Loaded-Start Blank Tape then Newline to Save" appears. Place a clean tape in the recorder set for Save, run tape and press Newline.

When the program has Saved, the option to take further copies is presented. The Break key may be used to abort both Load and Save routines.

After Break, Run will return you to the Load routine. Goto 180 will return you to the Save routine.

```
LIST 1  HEX DUMP
16514:  76 76 21 00 44 0E 01 3E
16522:  7F DB FE D3 FF 1F D0 17
16530:  17 38 02 18 F2 1E 94 06
16538:  1A 1D DB FE 17 CB 7B 7B
16546:  38 F5 10 F5 20 04 FE 56
16554:  30 DD 3F CB 11 30 D8 71
16562:  CD B7 40 18 D0 23 EB 2A
16570:  00 00 01 00 00 09 37 ED
16578:  52 EB D0 E1 C9 11 CB 12
16586:  CD 46 0F 30 27 10 FE 1B
16594:  7A B3 20 F4 21 00 44 CD
16602:  E1 40 CD B7 40 18 F8 5E
16610:  37 CB 13 C8 9F E6 05 C5
16618:  04 4F D3 FF 06 23 10 FE
16626:  CD 46 0F D0 06 1E 10 FE
16634:  0D 20 EF A7 10 FD 18 E1

LIST 2 "COPY"
   0 REM  -128 CHARACTERS-
  10 PRINT "ENTER NAME OF PROG."
  20 PRINT
  30 INPUT A$
  40 LET X=17419+LEN A$
  50 POKE X+1,69
  60 LET Y=X-16404
  70 RAND X
  80 POKE 16570,PEEK 16434
  90 POKE 16571,PEEK 16435
 100 RAND Y
 110 POKE 16573,PEEK 16434
 120 POKE 16574,PEEK 16435
 130 PRINT "START TAPE THEN N/L"
 140 INPUT D$
 150 CLS
 160 FAST
 170 RAND USR 16516
 180 PRINT "LOADED",,"START BLAN
K TAPE THEN N/L TO     SAVE"
 190 INPUT D$
 200 RAND USR 16580
 210 CLS
 220 PRINT "DONE:-ANOTHER COPY ?
"
 230 INPUT D$
 240 IF D$="Y" THEN GOTO 180
 250 SLOW

LIST 3 "RAMTOP"
   5 REM "RAMTOP"
  10 RAND 17408
  20 POKE 16388,PEEK 16434
  30 POKE 16389,PEEK 16435
  40 PRINT "RAMTOP NOW SET TO ";
PEEK 16388+256*PEEK 16389
  50 PRINT AT 2,0;"          "
  60 FOR N=1 TO 6
  70 NEXT N
  80 PRINT AT 2,0;"STOP TAPE"
  90 FOR N=1 TO 6
 100 NEXT N
 110 PRINT AT 4,0;"PRESS ANY KEY
 TO CONTINUE",,,"THEN LOAD ""COP
Y"""
 120 IF INKEY$="" THEN GOTO 50
 130 NEW
 140 SAVE "RAMTOP"
 150 GOTO 10
```

# Learning Tree

*D.J. West*

SPECTRUM

WRITTEN IN Basic for the 16K, Learning Tree asks you, the user, questions about an object you are thinking of, which you answer True or False by pressing T or F until it guesses the correct object or a false one.

It starts by asking you to input the names of two objects and a difference between them from which it forms the questions it will ask. This is the first branch of a tree of knowledge which builds up as you teach the computer the names of new objects and their differences.

By calling the Menu you can Save and Load trees of files which you have created, or start a new one.

When running the program Caps Lock is On, ie., the cursor should flash C.

Program structure is as follows:

| Line | Function |
|---|---|
| 0-90 | Initialise. |
| 100 | 1st branch. |
| 200-300 | Plain loop question and answer. |
| 900 | Enter unknown object. |
| 1000 | Modify tree routine. |
| 2000 | Word-wrap routine. |
| 2500 | Load tree. |
| 3000 | Save tree. |
| 4000 | Menu. |

```
   8 REM ***********************
   9 REM *                     *
  10 REM *    LEARNING TREE    *
  11 REM *                     *
  12 REM *  BY DJ WEST 4/84    *
  13 REM *                     *
  14 REM ***********************
  15 REM
  20 DEF FN P(X)=PEEK X+256*PEEK
 (X+1)
  30 POKE 23693,71: BORDER 0: PO
KE 23609,9
  40 CLEAR 29999: LET PN=30002
  90 BEEP .1,22
 100 INPUT "ENTER THE NAMES OF T
WO OBJECTS"'"EG. ""A CAT"" AND ""
A DOG"""'"1ST OBJECT ? ";T$''2ND
 OBJECT ? ";F$
 110 GO SUB 1000
 120 BEEP .4,20: PRINT ''"THINK
OF ANOTHER OBJECT AND      PRESS
A KEY"'' INK 6;"[ PRESS 'M' FOR
MENU ]"''
 125 LET PR=30002
 130 PAUSE 0: IF INKEY$="M" THEN
 GO TO 4000
 140 IF INKEY$="" THEN GO TO 130
 150 BEEP .1,20
 200 POKE 23692,255: LET F$=""
 205 IF NOT FN P(PR) THEN LET X=
2: LET F$="IS ": GO TO 220
 210 LET X=4
 220 LET W=PR+X: LET F$=F$+"IT "
 230 IF PEEK W THEN LET F$=F$+CH
R$ (PEEK W): LET W=W+1: GO TO 23
0
 240 BEEP .1,24: LET F$=F$+" ? [
T/F]"
 245 GO SUB 2000
 250 IF INKEY$="T" THEN BEEP .1,
36: PRINT INK 3;"> TRUE"'': LET
C=0: GO TO 280
 260 IF INKEY$="F" THEN BEEP .1,
12: PRINT INK 4;"> FALSE"'': LET
 C=2: GO TO 280
 270 GO TO 250
 280 IF X=2 AND C THEN LET F$=F$
(7 TO LEN F$-8): GO SUB 900: GO
TO 120
 285 IF X=2 THEN GO TO 120
 290 LET LP=PR+C
 300 LET PR=FN P(LP)
 310 GO TO 200
 900 BEEP .1,0: INPUT "I GIVE IN
."'"WHAT ARE YOU THINKING OF ?"'
T$
 910 POKE LP,PN-256*INT (PN/256)
: POKE LP+1,INT (PN/256)
1000 BEEP .1,12: INPUT "ENTER A
DIFFERENCE BETWEEN"'(T$);" AND "
;(F$)'"> ";(T$);" "; LINE D$
1100 LET LP=PN
1110 FOR F=1 TO LEN D$: POKE PN+
F+3,CODE D$(F): NEXT F
1120 LET PN=PN+F+4: POKE PN-1,0
1150 POKE LP,PN-256*INT (PN/256)
: POKE LP+1,INT (PN/256)
1200 POKE PN,0: POKE PN+1,0
1210 FOR F=1 TO LEN T$: POKE PN+
F+1,CODE T$(F): NEXT F
1220 LET PN=PN+F+2: POKE PN-1,0
1230 IF LP<>30002 THEN POKE LP+2
,PR-256*INT (PR/256): POKE LP+3,
INT (PR/256): RETURN
1250 POKE LP+2,PN-256*INT (PN/25
6): POKE LP+3,INT (PN/256)
1300 POKE PN,0: POKE PN+1,0
1310 FOR F=1 TO LEN F$: POKE PN+
F+1,CODE F$(F): NEXT F
1320 LET PN=PN+F+2: POKE PN-1,0
1390 RETURN
2000 LET D$=F$
2010 IF LEN D$<=32 THEN PRINT D$
: RETURN
2020 LET T$=D$(33 TO )
2030 LET D$=D$( TO 32)
2040 IF D$(LEN D$)<>" " THEN LET
 T$=D$(LEN D$)+T$: LET D$=D$( TO
 LEN D$-1): GO TO 2040
2050 PRINT D$
2060 LET D$=T$: GO TO 2010
2500 BEEP .4,44: CLS : PRINT "LO
ADING FILE FROM TAPE:"''"PLAYBAC
K TAPE NOW"'"ON ERROR ENTER [CO
NTINUE]"'"AND REPEAT"
2520 LOAD ""CODE
2530 LET PN=FN P(30000)
2540 GO TO 4000
3000 BEEP .3,33: CLS : PRINT "SA
VING FILE ON TAPE:"
3010 INPUT "WHAT NAME DO YOU WAN
```

(continued on next page)

(continued from previous page)

```
T TO GIVE   THE FILE ?"'F$
3015 IF NOT LEN F$ THEN GO TO 30
10
3020 POKE 30000,PN-256*INT (PN/2
56): POKE 30001,INT (PN/256)
3040 SAVE F$CODE 30000,PN-30000
3060 BEEP .4,44: PRINT ''PLAYBAC
K TAPE NOW"'"ON ERROR ENTER [C]O
NTINUE"'"TO RETURN TO 'MENU' AND
 REPEAT"'"SAVE-OPTION"
3070 VERIFY ""CODE 30000,PN-3000
0
3080 GO TO 4000
4000 BEEP .1,40: CLS : PRINT INK
 6;" MENU "'''"[1] LOAD FILE FRO
M TAPE"''"[2] SAVE FILE ONTO TAP
E"''"[3] START NEW FILE"''"[4] R
ETURN TO PRESENT FILE"
4005 PRINT INK 6''"PICK A NUMBER
"
4010 IF INKEY$="1" THEN GO TO 25
00
4020 IF INKEY$="2" THEN GO TO 30
00
4030 IF INKEY$="3" THEN RUN
4040 IF INKEY$="4" THEN CLS : GO
 TO 120
4050 GO TO 4010
```

# Airbrush

*Robert Graves,*
*Hanwell,*
*London.*

BBC

AIRBRUSH IS NOT another sketchpad routine. The problem with those is that they lay colour too thickly and too uniformly in neat straight lines — leaving the finished artwork looking just like its been drawn on a computer. Airbrush, however, allows colour to be built up on an area, laid randomly in a fine spray of colour. The size of the area over which you spray can vary from a single pixel's width — giving a performance similar to the sketchpad program on the Welcome tape — right up to approximately half the screen.

The results are much more realistic than usual, as shading is now possible, the colours achieve an un-computerish "texture" — though higher resolution graphics would achieve this even better — and, with care, even a certain amount of colour mixing is possible.

Unfortunately, this version doesn't allow for pictures being saved or stored for later use, and it can only be used with a joystick. The procedure "j-scan" could easily be modified to work with the cursor keys, though, and any occurrence of "Adval(o)" throughout the program replaced with a line looking for, say, the Return key.

```
10MODE7
20PROCTITLES
30MODE2
40*KEY10 OLD!M RUN!M
50ON ERROR GOTO 640
60VDU23;8202;0;0;0;
70X=640:Y=512:VDU19,8,0,0,0,0,19,15,7,0,0,0
80PROCpalette
90PROCairbrush
100DEFPROCjscan(SP)
110LR=ADVAL(1):UD=ADVAL(2)
120IFLR<70 AND X>0THEN X=X-SP
130IFLR>65400 AND X<1280 THEN X=X+SP
140IFUD<70 AND Y>72THEN Y=Y-SP
150IFUD>65400 AND Y<1024THENY=Y+SP
160ENDPROC
170DEFPROCkscan
180IFINKEY(-33) THEN PROCpalette
190IF INKEY(-1) AND INKEY(-120) THEN CLS:PROCpalette
200IF INKEY(-133) THEN RUN
210ENDPROC
220DEFPROCairbrush
230PROCbrushcrs
240GCOL0,COL:PLOT69,X+(RND(SZ+2)-SZ),Y+(RND(SZ*2)-SZ
)
250PROCjscan(4):PROCkscan
260IF ADVAL(0)=257 OR ADVAL(0)=513 THEN PROCbrushcrs
270GOTO240
280DEFPROCpalette
290FORN=16 TO 1136 STEP 160
300GCOL0,7
310MOVEN,8:DRAWN+128,8:DRAWN+128,64:DRAWN,64:DRAWN,8
320NEXT
330FORN=16 TO 1136 STEP 160
340GCOL0,(N-16)/160
350MOVEN+8,12:DRAWN+124,12:DRAWN+124,60:PLOT85,N+8,1
2:DRAWN+8,60:PLOT85,N+124,60
360NEXT
370X1=X:Y1=Y
380X=16
390GCOL0,7:MOVEX,8:DRAWX+128,8:DRAWX+128,64:DRAWX,64
:DRAWX,8
400PROCjscan(160)
410GCOL0,0:MOVEX,8:DRAWX+128,8:DRAWX+128,64:DRAWX,64
:DRAWX,8
420IF ADVAL(0)=257 OR ADVAL(0)=513THENGOTO440
430GOTO390
440COL=(X-16)/160
450X=X1:Y=Y1
460ENDPROC
470DEFPROCbrushcrs
480SZ=0
490GCOL4,7:MOVEX-SZ,Y-SZ:DRAWX-SZ,Y+SZ:DRAWX+SZ,Y+SZ
:DRAWX+SZ,Y-SZ:DRAWX-SZ,Y-SZ:GCOL4,0:MOVEX-SZ,Y-SZ:DRA
WX-SZ,Y+SZ:DRAWX+SZ,Y+SZ:DRAWX+SZ,Y-SZ:DRAWX-SZ,Y-SZ
500IFINKEY(-104) AND SZ<300 THEN SZ=SZ+4
510IF INKEY(-103) AND SZ>0 THEN SZ=SZ-4
520IF INKEY(-74) THEN ENDPROC
530PROCjscan(4):PROCkscan
540GOTO490
550DEFPROCTITLES
560PRINTTAB(13,0);CHR$(141);CHR$(131);"AIRBRUSH";TAB
(13,1);CHR$(141);CHR$(131);"AIRBRUSH"
570PRINTTAB(10,3)"by Robert Graves"
580PRINTTAB(12,5);CHR$(130)"INSTRUCTIONS";TAB(12,6)"
____________"
590PRINTTAB(0,8)"On pressing the space bar a palette
 of  eight colours will be produced across   bottom of
 the screen,move the flashing  box over the colour you
 wish to paint   with,and press the joystick fire butt
on."
600PRINT"The screen cursor marks the point or    are
a over which you wish to 'spray'.It  can be moved arou
nd the screen using thejoystick (RETURN to paint,FIRE
to stop) and enlarged or decreased by '>' and '<'respe
ctively."
610PRINT
620PRINT"f(0)will allow you to change colour,  and S
HIFTedf(9)will clear the screen."
630IF GET$<>" "THENGOTO630 ELSE ENDPROC
640IF ERR=17 THEN GOTO 80
>
```

# UDG * 8

*Brian Cooper,*
*Lytham,*
*Lancashire.*

SPECTRUM

MACHINE CODE BUFFS must be on the increase. Regular readers of *Your Computer* will know that published programs become more and more sophisticated. But, while machine code makes for faster action, the beginner will find it difficult to follow how the routines work and entering pages full of numbers is not a pleasant prospect. Instead of hours typing in strings of data in read statements, this is the program to turn creation of User Defined Graphics — UDGs — from a chore into a game, with a guarantee of perfect results. And not just single characters.

The program provides a grid which enables up to eight UDGs to be worked on together — ideal when a composite figure is needed — and continuously show the results. Unlike the single character grid on the Spectrum Horizons tape, with this program characters can be seen relative to each other as the UDG set is built up. Any single pixel can easily be changed.

Two groups of eight UDGs make a string of sixteen characters which are then copied away to a separate area of memory, to be followed by as many further sets as are ever likely to be wanted. Any one of these sets can then be called back and used at will, and all can be stored on tape.

This program incorporates a number of features which may provide instructive examples to the new programmer. Though written in Basic and therefore easy to follow, the program is reasonably quick in operation and makes full use of the system variables relating to UDGs.

Almost every Spectrum owner will know that each character comprises an eight by eight matrix of dots or pixels. UDGs can be entered one "line" at a time as bytes from USR 'A' to USR 'R' + 7. The program works by holding the line being worked on in the form of a string, for example

BIN 10101011

and this is constantly updated from an array which monitors the grid as the program progresses.

The numeric value of the string is continuously Poked to memory, and the

graphics set printed cut with letters grouped in various useful combinations to show the effect actual size at the bottom of the screen.

All this happens quite quickly — the main subroutine is near the start of the program in lines 6020/30 to keep time to a minimum.

The complete program can easily be incorporated in a larger program and some of the subroutines may be useful. For example, the various sets stored away are called up by the lines from 6450. This is achieved by Poking successive values into 23675/6 — UDG: see page 175 of the manual — to point to the first character of the set.

```
6010 DIM r(21,8): LET stgrset=40
0: CLEAR stgrset+128-1: LET stgr
set=400: LET count=1: GO SUB 660
0: GO TO 6040
6019 REM POKES LINES TO UDG
6020 LET q$="BIN 00000000": LET
st=(INT (y/8))*8: LET q$(5 TO 8)
=r$(x,st+1 TO st+8)
6030 POKE (USR "a"+64*(count=2)+
st+24*(x>8)+x)-1,VAL q$: PRINT A
T 18,0;"A B C D E F G H I J K L
M N O P ";AT 20,4;"ABCD AB CD IJ
KL IJ KL            EFGH EF GH MN
OP MN OP": LET y=y+1: LET x$="":
 RETURN
6039 REM SETS UP GRID
6040 CLS : RESTORE : FOR t=0 TO
15: READ a: POKE USR "q"+t,a: NE
XT t
6050 DATA 255,129,129,129,129,12
9,129,255,85,170,85,170,85,170,8
5,170
6060 FOR i=1 TO 16: PRINT ; PAPE
R 5; INK 1;AT i,0;"0000000000000
0000000000000000000": NEXT i
6070 FOR m=4 TO 16 STEP 4: FOR n
=3 TO 31 STEP 4: PRINT ; PAPER 5
;AT m,n;TAB n;" ": NEXT n: NEXT
m
6100 LET x=1: LET y=0: GO SUB 65
00
6110 DIM r$(16,32)
6120 FOR t=1 TO 16: LET r$(t)="0
0000000000000000000000000000000"
: NEXT t
6129 REM READS KEYS
6130 PAUSE 0
6140 LET x$=INKEY$
6150 IF x$="i" OR x$="I" THEN LE
T r$(x,y+1)="1": PRINT ; INK 1;A
T x,y;"█": GO SUB 6020: IF y<(32
-last) THEN GO TO 6130
6160 IF x$="p" OR x$="P" THEN LE
T r$(x,y+1)="0": PRINT ; PAPER 5
;AT x,y;" ": GO SUB 6020: IF y<(
32-last) THEN GO TO 6130
6170 IF x$="l" OR x$="L" THEN GO
 SUB 6500
6180 IF x$="f" OR x$="F" THEN GO
 TO 6400
6190 IF x$="5" OR x$="6" OR x$="
7" OR x$="8" THEN PRINT ; PAPER
5; INK 1;AT x,y;"R": PAUSE 5: PR
INT ; PAPER 5; INK 1;AT x,y;"0":
 IF r$(x,y+1)="1" THEN PRINT ; I
NK 1;AT x,y;"█"
6199 REM JOBS POSITION ON GRID
6200 LET x=x+(x$="6")-(x$="7")
6220 LET y=y+(x$="8")-(x$="5")
6230 IF y=(32-last) OR y=(-1+fir
st) THEN LET y=(31-last)*(y=(-1+
first))+first*(y=(32-last)): LET
 x=x+(y=0+first)-(y=(31-last))
6240 IF x=0 OR x=17 THEN LET x=1
6*(x=0)+1*(x=17)
6250 GO TO 6130
6399 REM SAVE 16 UDG TO NEW AREA
6400 IF count=1 THEN LET count=2
: GO TO 6040
6410 IF count=2 THEN LET count=1
: CLS : PRINT ;"SAVING CHARACTER
 SET AT ";stgrset*128: FOR n=0 T
O 144: POKE (stgrset-128+n),PEEK
 (USR "a"+n): NEXT n: LET stgrse
t=stgrset+1: CLS
6420 CLS : PRINT ;"If you have f
inished making     characters th
en press Y.""""If not, press any
thing else.": PAUSE 0: IF INKEY$
="y" OR INKEY$="Y" THEN GO TO 64
40
6430 GO TO 6040
6439 REM SAVES ALL UDGS TO TAPE
6440 CLS : SAVE "Graphisets"CODE
 200*256,(stgrset-401)*128
6449 REM PRINTS SETS WITH OPTION
 TO SELECT UDG SET REQUIRED
6450 FOR n=400 TO stgrset-1: POK
E 23676,(INT (n+1)/2-1): POKE 23
675,(0+128*(n/2<>INT (n/2))):
PRINT ;"SET ";n-399'"A B C D E F
 G H I J K L M N O P '""A B AB C
D C D ABCD IJ KL IJKL'""E F EF G
H G H EFGH MN OP MNOP";: NEXT n
6460 PRINT AT 21,0;"Enter number
 of set you want   ": PAUSE 0: L
ET f$=INKEY$: LET f=VAL f$: IF f
<1 OR f>(stgrset-400) THEN CLS :
 GO TO 6450
6470 POKE 23676,((INT (f+400)/2-
1)): POKE 23675,0+128*(f/2=(INT
(f/2))): CLS : STOP
6499 REM LIMITS SIZE OF GRID
 TO BE WORKED ON
6500 LET h$="
                ": PRINT AT 18,0;h$
;AT 19,0;"No(s) of blocks to be
filled      a=1, b=1&2, c=1 TO 3,
d=1 TO 4  e=2&3, f=4
                ": PAUSE 0: LET e$=INKE
Y$
6510 IF e$="a" OR e$="A" THEN LE
T first=0: LET last=3*8: GO TO 6
570
6520 IF e$="b" OR e$="B" THEN LE
T first=0: LET last=2*8: GO TO 6
570
6530 IF e$="c" OR e$="C" THEN LE
T first=0: LET last=1*8: GO TO 6
570
6540 IF e$="e" OR e$="E" THEN LE
T first=1*8: LET last=1*8: GO TO
 6570
6550 IF e$="f" OR e$="F" THEN LE
T first=3*8: LET last=0: GO TO 6
570
6560 IF e$="d" OR e$="D" THEN LE
T first=0: LET last=0: GO TO 657
0
6565 GO TO 6500
6570 LET y=first: PRINT AT 18,0
;h$;h$;h$;h$;: PRINT AT x,y;"R":
 RETURN
6580 GO TO 6510
6599 REM INSTRUCTIONS
6600 CLS : PRINT "DO YOU WANT IN
STRUCTIONS? Y/N ": PAUSE 0: IF I
NKEY$="y" OR INKEY$="Y" THEN CLS
 : PRINT "
To use the grid which follows,
use I for Ink, P for paper
and the direction keys as
required.": GO TO 6620
6610 RETURN
6620 PRINT '"
You can Limit the number of
Characters you are working on
by pressing  L ."''"
When you have made the
characters you want press F for
Finished." '"Each grid makes 8
characters."''"
Press ENTER": PAUSE 0: CLS
6630 PRINT ;
"To start with you can either
 work over the letters
 representing the equivalent
 UDGs, or make them blank by
 pressing B now"'''
"Press a key": PAUSE 0: IF INKEY
$="b" OR INKEY$="B" THEN CLS : F
OR n=USR "a" TO USR "p"+7: POKE
n,0: NEXT n
6640 CLS : PRINT ;"
You may build up as many sets as
you wish,each of 16 characters
a to p"
6650 PRINT ;"
The sets are stored in one long
string,and a routine is included
to select the one needed."''"
PRESS ENTER": PAUSE 0
6660 RETURN
```

# Matrix Run

*Johan Berge, Norway.*

DRAGON

SURVIVOR IS A fast-moving matrix game. It runs on a Dragon 32/64 and is written entirely in Basic. It is actually the same game as Matrix Run published in *Your Computer* October 1983, written by Russ Whitehead.

I was amazed of the superior Boolean algebra in this game, and therefore I converted it to my Dragon 32. Necessary instructions are contained in the following program.

```
10 CLEAR:CLS0:GOSUB 500
20 F=1:A=1488:IFK<2.5 THENGOSUB80ELSEGOSUB120
30 FOR X=0TO 300:NEXTX:FOR C=Z TO 100:A$=INKEY$:F=F+(A
$=CHR$(8))-(A$=CHR$(9)):F=F-4*(F=0)+4*(F=5)
40 A=A+(F=4)-(F=2)+32*(F=1)-32*(F=3):V=PEEK(A):POKEA,1
91
50 IFV=128THEN NEXT C:PLAY"O3V16T9CDEFGAB":U=U+1:Z=0:K
=K+0.5:GOTO20
60 Z=C:PLAY"O2T5V16BAGFEDC"::L=L+1:IFL=3THEN210
70 GOTO20
80 CLS0:FOR C=1TO U:POKE 1024+INT(RND(511)),175:NEXTC:
FORC=0TO32:POKE1024+C,239:POKE1503+C,239:NEXTC
90 FOR C=1TO15:POKE 1024+C*32,239:POKE1055+C*32,239:NE
XTC
100 FORC=2TO30STEP4-K:FORD=2TO13STEP4-K:POKE1024+INT(C
)+INT(D)*32,159:NEXTD,C
110 PRINT@11,"SURVIVOR";:RETURN
120 CLS0:FOR C=0TO 32:POKE 1024+C,175:POKE 1503+C,175:
NEXT C:FORC=1TO15:POKE 1024+C*32,175:POKE1055+C*32,175
:NEXT
130 FOR D=0TO10 STEP2:FORC=2+D TO 29-D:POKE 1088+C+D*3
2,223:POKE1408+C-D*32,223:NEXTC
140 FORG=2-D TO 12-D:POKE1024+2+D+G*32,223:POKE1053-D+
G*32,223:NEXTG,D:PRINT@10,"OPEN GATES";:FORX=0TO300:NE
XTX
150 A$=INKEY$:F=F+(A$=CHR$(8))-(A$=CHR$(9))
160 F=F-4*(F=0)+4*(F=5):A=A+(F=4)-(F=2)+32*(F=1)-32*(F
=3):V=PEEK(A):POKE A,191
170 IFA=1071 THEN FORC=3TO12STEP4:POKEA+C*32,128:NEXT
180 IF A=1263THEN230
190 IFV=128THEN150
200 SOUND100,3:L=L+1:IFL<>3 THEN20
210 CLS
220 GOTO 700
230 CLS:PRINT@235,"WELL DONE!":PLAY"T20DFADFADFAGECGEC
L1A"
240 PRINT@240,"NOW IT'S EVEN HARDER!":K=0:POKE &HFFD7,
0:REM POKES HIGHER SPEED
241 GOTO 20
500 CLS4
510 PRINT@228,"DO YOU WANT INSTRUCTIONS";
520 S$=INKEY$:IF S$="N" THEN RETURN
530 IFS$<>"Y" THEN 520
540 CLS
550 PRINTTAB(7)"S U R V I V O R"
560 PRINT
570 PRINT"THE OBJECT IN THIS GAME IS TO   RUN THE WORM
 100 CYCLES WITHOUT CRASHING."
580 PRINT"BEWARE OF THE BLUE DOTS AND THE GRID,WHICH G
ETS THINNER FOR EACHSCREEN."
590 PRINT"AFTER YOU HAVE MANAGED SURVIVINGFIVE SCREENS
 YOU ARRIVE THE"
600 PRINT"LAST ONE,WHICH IS COMPLETELY     DIFFERENT."
610 PRINT"THERE YOU HAVE TO REACH THE      CENTRE OF TH
E MAZE.":PRINTTAB(10)"HIT A KEY"
620 IF INKEY$=""THEN620
630 CLS:PRINT
640 PRINT"YOU USE THE RIGHT AND LEFT ARROWKEYS."
650 PRINT"WHEN YOU PRESS THE RIGHT KEY,    THE WORM WIL
L TURN RIGHT."
660 PRINT"A PRESS ON THE LEFT KEY WILL     TURN THE WOR
M TO LEFT.":PRINT:PRINTTAB(5)"YOU HAVE THREE LIVES."
670 PRINT:PRINT"    GOOD LUCK,YOU'LL NEED IT!":PRINT:PR
INTTAB(10)"HIT A KEY."
680 IF INKEY$=""THEN680 ELSE RETURN
700 SC=U*10+(C/20):IF SC<HS THEN GOTO730
```

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```
710 PRINT:PRINT:PRINT:PRINT:PRINT" A  N E W  H I G H
S C O R E !"
715 HS=INT(SC)
720 PLAY"T20EGEGEGCP5GEGECP5CECECEBP5ECECECG"
730 CLS:PRINT@202."GAME OVER";
735 FOR R=0 TO 12:PRINT@136+R,CHR$(159);:PRINT@264+R,C
HR$(159);:NEXT:FOR R=0 TO 96 STEP 32:PRINT@168+R,CHR$(
159);:PRINT@180+R,CHR$(159);:NEXT
740 PRINT@330,"SCORE";INT(SC);:PRINT@361,"HI SCORE"HS;
750 PRINT@419,"DO YOU WANT ANOTHER GAME";
760 A$=INKEY$:IF A$="Y"THEN K=0:SC=0:L=0:U=0:Z=0:GOTO
20
765 IF A$="N" THEN CLS:END
770 GOTO 760
```

## Renumber

*J Bull,*
*Taunton,*
*Somerset.*

ORIC

THIS PROGRAM IS a machine-code renumberer which was written on a 48K machine. The program will renumber any size Basic program. It has been designed to renumber the whole of a Basic program of lines not greater then 64000. However it will handle Goto, Gosub, Then and Else and On Goto/Gosub commands.

After typing in the Basic program, which Pokes the machine code, it should be Saved as a Basic program so it can be checked later, if necessary. After Saving the Basic type Run. Now type New and CSave

CSAVE "RENUMBER", A #9A00, E #9D40

This now Saves the code directly.

When you want to renumber a Basic program type

HIMEM #99FF

and

CLOAD" "

the machine code.

Now two variables have to be set. The first is at which line number the Basic will be renumbered and the size of increment between each line. An example of this is:

DOKE £400,(NEW STARTING LINE OF PROGRAM)

DOKE // 402, (INCREMENT)

To get the machine code going call # 9AC0. As it is a machine code renumberer it is very fast and even the largest of program take a very short time to renumber.

Although I wrote the program on a 48K machine I see no reason why it should not work on a 16K machine.

```
 1 REM ** RENUMBER **
 2 REM **  J.BULL  **
 3 REM **  29/1/84 **
 4 N=#9A00
 5 REPEAT
 6 READD$
 7 C=VAL("#"+D$):POKEN,C
 8 N=N+1:UNTILD$="??"
 9 DATAAD,00,04,48,AD,01,04,48,AD,02,04,48,AD,03,04,48
,A5,9A,85,46,A5,9B,85
 10 DATA47,A0,00,B1,46,D0,05,C8,B1,46,F0,2B,A9,01,8D,0
0,04,A9,FA,8D,01,04
 11 DATAA9,01,8D,02,04,A9,00,8D,03,04,20,53,9A,68,8D,0
3,04,68,8D,02,04,68
 12 DATA8D,01,04,68,8D,00,04,20,53,9A,60,68,68,68,68,6
0,D8,A9,00,8D,07,04
 13 DATA8D,08,04,A5,9A,85,46,A5,9B,85,47,38,AD,00,04,E
D,02,04,8D,11,04,AD
 14 DATA01,04,ED,03,04,8D,12,04,A0,00,B1,46,AA,C8,B1,4
6,A8,D0,04,E0,00,F0
 15 DATA30,A5,46,CD,07,04,D0,07,A5,47,CD,08,04,F0,22,1
8,AD,11,04,6D,02,04
 16 DATA8D,11,04,AD,12,04,6D,03,04,8D,12,04,A5,46,85,4
8,A5,47,85,49,84,47
 17 DATA86,46,4C,77,9A,A0,02,B1,48,8D,09,04,AA,C8,B1,4
8,8D,0A,04,20,C6,9C
 18 DATAA2,05,BD,13,04,9D,0B,04,CA,10,F7,A0,02,AD,11,0
4,91,48,AA,C8,AD,12
 19 DATA04,91,48,20,C6,9C,A5,9A,85,46,A5,9B,85,47,A5,4
8,8D,07,04,A5,49,8D
 20 DATA08,04,A0,04,B1,46,F0,23,10,1D,C9,97,F0,0C,C9,9
B,F0,08,C9,C8,F0,04
 21 DATAC9,C9,D0,06,20,44,9B,4C,1A,9B,C9,B4,D0,03,20,1
7,9C,C8,4C,F7,9A,A0
 22 DATA00,B1,46,AA,C8,B1,46,85,47,86,46,D0,C9,E0,00,D
0,C5,AD,11,04,CD,00
 23 DATA04,D0,08,AD,12,04,CD,01,04,F0,03,4C,5C,9A,60,C
8,20,2E,9D,8C,06,04
 24 DATA20,9C,9C,90,04,88,4C,16,9C,AE,08,04,EC,19,04,D
0,F5,CA,30,0A,BD,0C
 25 DATA04,DD,1A,04,D0,EA,F0,F3,38,A2,00,AD,13,04,ED,1
9,04,8D,04,04,10,02
 26 DATAA2,FF,8E,05,04,18,98,65,46,85,40,A5,47,69,00,E
5,41,18,A5,40,6D,04
 27 DATA04,85,44,A5,41,6D,05,04,85,45,A5,9C,85,42,A5,9
D,85,43,20,35,9C,A5
 28 DATA46,85,48,A5,47,85,49,A0,00,18,B1,48,0E,6D,04,0
4,91,48,AA,C8,B1,48
 29 DATA08,6D,05,04,91,48,28,F0,08,28,85,49,86,48,4C,A
A,9A,28,D0,F6,A9,00
 30 DATA91,48,88,91,48,A5,47,CD,08,04,90,07,A5,46,CD,0
7,04,E0,13,18,AD,07
 31 DATA04,6D,04,04,8D,07,04,AD,08,04,6D,05,04,8D,08,0
4,18,A5,9C,6D,04,04
 32 DATA85,9C,A5,9D,6D,05,04,E5,9D,AC,06,04,A2,00,BD,1
4,04,91,46,C8,E8,EC
 33 DATA13,04,D0,F4,8E,60,C8,B1,46,D0,02,88,60,C9,97,F
0,04,C9,9B,D0,F1,20
 34 DATA44,9B,C8,20,2E,9D,B1,46,C9,2C,F0,F3,8E,60,93,4
8,A0,00,A5,41,C5,45
 35 DATA90,20,A5,40,C5,44,90,1A,B1,40,91,44,E6,44,D0,0
2,E6,45,20,91,9C,D0
 36 DATA03,68,A8,60,E6,40,D0,EA,E6,41,D0,E6,38,A5,42,E
5,40,AA,A5,43,E5,41
 37 DATA48,18,8A,65,44,85,44,68,65,45,85,45,B1,42,91,4
4,A5,44,D0,02,C6,45
 38 DATAC6,44,20,91,9C,F0,CE,A5,42,D0,02,C6,43,C6,42,4
C,75,9C,A5,40,C5,42
 39 DATAB0,04,A5,41,C5,43,60,A2,00,B1,46,20,22,9D,B0,2
0,C8,9D,1A,04,E8,A9
 40 DATA04,BD,19,04,B1,46,20,22,9D,B0,0A,C8,9D,1A,04,E
8,CE,19,04,D0,EF,8E
 41 DATA19,04,88,18,60,8D,05,04,8E,04,04,A2,00,8E,13,0
4,A0,00,A9,05,8D,06
 42 DATA04,A9,30,9D,14,04,38,AD,04,04,F9,37,9D,8D,04,0
4,AD,05,04,F9,38,9D
 43 DATA8D,05,04,90,05,FE,14,04,D0,E6,AD,13,04,D0,07,B
D,14,04,C9,30,F0,04
 44 DATAE8,EE,13,04,18,AD,04,04,79,37,9D,8D,04,04,AD,0
5,04,79,38,9D,8D,05
 45 DATA04,C8,C8,CE,06,04,D0,E7,60,C9,30,90,06,C9,3A,B
0,02,18,60,38,60,B1
 46 DATA46,C8,C9,20,F0,F9,88,60,10,27,E8,03,64,00,0A,0
0,01,60,"??"
```

## Animator

*Derek Gladding,*
*Hathersage,*
*Derbyshire.*

DRAGON

LOW-RESOLUTION Animator is a program I have written to produce short animated sequences of graphics on the Dragon 32 micro. The frames are entered one by one using a graphic design program, saved in memory and then animated by machine code. The program is very easy to use, although designing 40 or so frames of a cartoon can take some time.

First, the frame must be drawn out on the screen. The graphics design program is controlled by the arrow keys moving a small flashing cursor around the screen — owing to the limitations of the low resolution graphics mode, the cursor will turn the whole block it is in to white if it is moved against a coloured background, but it will return the block to its orginal colour when moved away. The system has three modes of operation:

PLOTTING MODE — Graphics are entered by pressing a number key from 0-8, which sets the pixel under the cursor to that colour.

FOLLOW MODE — This is accessed by pressing F and then a number key. When in follow mode, the cursor will leave a trail behind it in the colour corresponding to the number key pressed when follow mode was accessed. To leave follow mode, press any command key apart from the arrow keys.

TEXT MODE — This is accessed by pressing T. It enables you to type in text — for captions, speech bubbles, etc. — starting at the cursor position. To leave this mode, press the down arrow. The caption had better be kept on for several frames if it is to be easily read.

To finish a frame and to save it in memory, press S. The screen will not be cleared in case the next screen is only slightly different from the last. If the screen needs clearing, press C and enter a colour. When the sequence is finished, press Enter and the computer will provide an animated display of your frames by flicking through them rapidly. If the speed is

too great, or the program does not provide enough time for your sequence, add a delay loop at line 715 to slow it down.

The program works by calling a machine code routine to copy the low-resolution screen up into higher memory. Every frame is stored in the memory above the program and when the Enter key is pressed to animate the sequence, the program runs through all these by calling a similar machine code routine to move it back again down to the low-resolution screen.

It would have been possible to animate to pictures even faster by simply altering the screen start location — FFC7hex to FFD3 hex — in the SAM, but unfortunately, in the older Dragons, this doesn't seem to work above 4000 hex (16384 decimal). Anyway, this provides more than adequate speed of animation copying memory from one place to another.

```
10 'ANIMATOR 1.1
20 'BY DEREK GLADDING
30 '(C) DEREK GLADDING 1984
40 '
50 PMODE 0,1:PCLEAR 1
60 CLEAR 100,&H2000
70 CLS
80 PRINT@0,"LOW RESOLUTION ANIMATED CARTOONS"
90 H=0:GOSUB 760
100 DEF FNH(N)=INT(N/256)
110 DEF FNL(N)=256*(N/256-FNH(N))
120 '
130 'MACHINE CODE
140 '
150 '          ORG $7000
160 'DOWN      LDX #$ (PAGE)
170 '          LDU #$400
180 'LOOP1     LDA ,X+
190 '          STA ,U+
200 '          CMPU #$600
210 '          BLO LOOP1
220 '          RTS
230 'UP        LDX #$ (PAGE)
240 '          LDU #$400
250 'LOOP2     LDA ,U+
260 '          STA ,X+
270 '          CMPU #$600
280 '          BLO LOOP2
290 '          RTS
300 '
310 DATA 8E,00,00,CE,04,00,A6,80,A7,C0,11,83,06,00,25,
F6,39
320 DATA 8E,00,00,CE,04,00,A6,C0,A7,80,11,83,06,00,25,
F6,39
330 FOR L=&H7F00 TO &H7F21:READ H$:POKE L,VAL("&H"+H$)
:NEXT
340 V$="^'+CHR$(8)+CHR$(9)+CHR$(10)+"12345678OSCFT"+CH
R$(13)
350 PRINT:PRINT"COMMANDS:-":PRINT
360 PRINTTAB(3);"ARROW KEYS TO MOVE CURSOR"
370 PRINTTAB(3);"0-8    TO SET POINT"
380 PRINTTAB(3);"S      TO SAVE PICTURE"
390 PRINTTAB(3);"C      TO CLEAR SCREEN"
400 PRINTTAB(3);"F      TO FOLLOW POINTER"
410 PRINTTAB(3);"T      TO ADD TEXT"
420 PRINTTAB(3);"ENTER TO FINISH"
430 PRINT@480,"** PRESS SPACEBAR TO CONTINUE *";
440 POKE 1535,106
450 IF INKEY$<>" " THEN 450
460 CLS0
470 MO$="PLOTTING":MO=1:PA=0
480 PRINT@480,"PAGE";PA;"  ";MO$;" MODE.   ";
490 IF MO=3 THEN PRINT@BY-1024,;:GOSUB 910:MO=1:MO$="P
LOTTING"
500 BY=1024+INT(X/2)+INT(Y/2)*32:CO=PEEK(BY)
510 SET(X,Y,5):FORD=1TO5:NEXT:RESET(X,Y)
520 A$=INKEY$:IF A$="" OR INSTR(V$,A$)=0 THEN 510
530 PLAY"T40O4C"
540 N=INSTR(V$,A$)
550 POKE BY,CO
560 IF N=1 THEN Y=Y-1:IF Y=-1 THEN Y=29
570 IF N=2 THEN X=X-1:IF X=-1 THEN X=63
580 IF N=3 THEN X=X+1:IF X=64 THEN X=0
590 IF N=4 THEN Y=Y+1:IF Y=30 THEN Y=0
600 IF MO=2 AND C>0 THEN SET(X,Y,C):IF N>4 THEN MO=1:M
O$="PLOTTING"
610 IF MO=2 AND C=0 THEN RESET(X,Y):IF N>4 THEN MO=1:M
O$="PLOTTING"
620 IF N>4 AND N<13 THEN SET(X,Y,N-4)
630 IF N=13 THEN RESET(X,Y)
640 IF N=14 THEN GOSUB 780:PA=PA+1:IF PA=46 THEN 700
650 IF N=15 THEN GOSUB 840
660 IF N=16 THEN MO$="FOLLOW":MO=2:GOSUB 870:IF C=-1 T
HEN 660
670 IF N=17 THEN MO$="TEXT":MO=3
680 IF N=18 THEN 700
690 GOTO 480
700 T=PA-1
710 FOR PA=0 TO T
720 GOSUB 930
730 NEXT
740 GOTO 710
750 END
760 FOR L=1024+(H*32) TO 1024+(H*32)+31:POKE L,(PEEK(L
) AND &HBF):NEXT
770 RETURN
780 P=PA*512+&H2000
790 POKE &H7F12,FNH(P):POKE &H7F13,FNL(P)
800 PRINT@480,STRING$(31,128);
810 POKE 1535,128
820 EXEC &H7F11
830 RETURN
840 PRINT@480,"CLEAR SCREEN - COLOUR ?";
850 GOSUB 870:IF C>-1 THEN CLS C
860 RETURN
870 A$=INKEY$:IF A$="" THEN 870
880 C=INSTR("012345678",A$)
890 C=C-1
900 RETURN
910 A$=INKEY$:IF A$="" THEN 910
920 IF A$=CHR$(10) THEN RETURN ELSE PRINTA$;:GOTO 910
930 P=&H2000+PA*512
940 POKE&H7F01,FNH(P)
950 POKE&H7F02,FNL(P)
960 EXEC&H7F00
970 RETURN
```

# Program Scanner

*Don Scarrott,*
*Workington,*
*Cumbria.*

SPECTRUM

WHEN DEBUGGING a program, you often need to know where and how a particular variable is used. It is very difficult to be sure you have identified every occurrence yourself, so I tried to write a Basic program to do the search for me. It worked, but was dreadfully slow, taking some 10 minutes to scan a long program.

This machine-code version is much shorter, and is as fast as the normal listing. It scans the program lines, skipping Rem and Data lines, rushing past anything between quotes, jumping over the embedded numbers, converting upper to lower case, and comparising names to what you have placed in z$. If they match, that line is printed.

The machine code is located at 63929 with a length of 291. To use it you merely set the variable name into z$, and Randomise USR 63292. It will then list all the lines containing that variable on the screen.

To enter the machine code, first type in the hex loader from figure 1, and Run it. Figure 2 shows a column of decimal addresses on the left, and four columns of hex on the right.

Enter the first address from figure 2, and then the blocks of hex, one after the other. Each block contains its own check digit, so if it is wrong, it bleeps and expects you to enter it again.

*Figure 3*

```
8691 REM Progan Prompter
8692 CLEAR 63928
8693 LOAD "PROGAN3" CODE
8694 INPUT "Z$ ";Z$
8695 PRINT : PRINT "Lines contai
ning ";z$
8696 RANDOMIZE  USR 63929
8697 GO TO 8694
8698 SAVE "progan"
8699 SAVE "PROGAN3" CODE 63929,2
91: STOP
```

*(continued on next page)*

(continued from previous page)

You only have to enter one address at the beginning, but do check that the ones on the screen correspond to those in the figure, in case you miss a line. If you do miss something, run again from the last correct line.

When you want to get out of the loop, delete the first quotes and enter Stop.

When it has been entered correctly, you may like to take a backup copy by entering

SAVE "PROGAN" CODE 639 29, 291

You can test it at this stage by:

"LET ZS = "b":RANDOMISE USR 63929: PAUSE 0"

However, for convenience, you can prepare a prompter tape as follows.

New, and type in the prompter program from figure 3. Put a fresh tape in the recorder and Goto 8698 to save first the Basic program and then the machine code. You may like to verify them before proceeding.

Load your target program, enter

MERGE""

and start the prompter tape. Stop it as soon as the Basic part has loaded. Enter

Goto 8692

and start the tape again. When the code has loaded, the z$ prompt should appear. Enter the variable name of interest, and watch the lines scroll up the screen.

If you want hard copy, get out of the loop by deleting the quotes and entering Stop. Then enter

OPEN #2,"p"

and

Goto 8694

to re-enter the loop.

```
10 REM HEXLOADER
11 REM by Don Scarrott
12 CLEAR 63000
20 DIM n(5)
30 INPUT "Start address(DECIMA
L) ";a
55 PRINT "Please use upper cas
e"
60 PRINT : PRINT a;
62 FOR K=1 TO 4
64 INPUT "4 Hex digits+check "
;x$
65 IF x$="END" THEN  STOP
70 IF  LEN x$ <> 5 THEN  BEEP
1,1: GO TO 64
80 LET s=0
90 FOR j=1 TO 5
100 LET b= CODE x$(j)-48
110 IF b>9 THEN  LET b=b-7
115 IF b>15 THEN  BEEP 2,1: GO
TO 64
120 IF j <> 5 THEN  LET s=s+b
130 LET n(j)=b
140 NEXT j
150 LET p= INT (s/16): LET r=s-
16*p
160 IF b <> r THEN  BEEP 1,1: G
O TO 64
170 POKE a,16*n(1)+n(2)
180 LET a=a+1
190 POKE a,16*n(3)+n(4)
200 LET a=a+1
202 PRINT " ";X$;
204 NEXT K
210 GO TO 60
212 ERASE "M";1;"hexloader"
214 SAVE *"m";1;"hexloader"
216 VERIFY *"m";1;"hexloader"
217 STOP
```

```
63929  11D54 FAED4 4B5D1 5CEDC
63937  43D9D FAED4 535DA 5CCDA
63945  B2287 ED4BA D9FAF ED432
63953  5D5C3 30025 CF01C 2346F
63961  78324 D4FAA 2323A 22D23
63969  FA7EE CDAE1 FA777 23106
63977  F82A3 535C9 22CCC FA7EE
63985  E6C00 C0231 234E7 2346F
63993  ED432 D0FA6 23E58 0922D
64001  CEFA3 3E001 32D8A FA32E
64009  DBFA1 3AD4E FA474 2AD2B
64017  FAD17 1AFE8 0D287 78FEC
64025  22206 103AE D8FAE A7203
64033  033C2 1802B 3E001 32D8A
64041  FA182 4E4F5 3AD82 FAFE6
64049  00790 2045B FEEA5 28576
64057  FEE4F 28532 FE0EB 200E0
64065  E5216 05005 19EB3 E13E0
64073  00325 DBFA1 182B6 CDAE1
64081  FA30C F44F6 3ADB5 FAFE6
64089  00790 201D0 BEF5D CD968
64097  FAF19 20158 C5E54 0528F
64105  17CD1 96FA8 23139 1ACD4
64113  AEFA1 3008B BE283 EFE1C
64121  C1131 18968 E1C1C 18C7C
64129  E1C1C 131AF CDAE1 FA384
64137  8ACDB 9EFA0 3E0DE D72A0
64145  CEFA3 C3EDA F93A5 DBFA1
64153  30324 DBFA1 C9E58 D5C53
64161  2ACC4 FA11B 01001 CD654
64169  18C16 D1E1D C9FE2 24280
64177  18FE6 3038E 10FEE 3A388
64185  10FEE 41380 08FE5 5B38B
64193  06FE3 7B38D 04A75 C9C67
64201  2037C C9005 00000 00000
64209  00000 00000 5A245 3A00D
64217  00000 00000 00000 00000
```

# Merge Command

*William Fong,*
*Charlton,*
*London SE7.*

CBM-64

ONE OF THE MAJOR drawbacks of Commodore Basic is that it has no merge command like the Spectrum. I have written a program which will compensate for that; it simulates the Merge command.

When you have typed the program out do not run it until you have a copy saved on tape. This is because the program may crash if a mistake has been entered. When all is ready Run the program and the screen should go black and "Ready" will appear. This program is situated above the RAM in which you use so it will not crash with your programs. You now may load your programs.

However, you do not use the command Load but

SYS 40706 "PROGRAM NAME IF YOU KNOW IT"

This is used instead of Merge because the Basic interpreter will not recognise this command.

Remember that the programs which you intend to string together must have different line numbers or lines will over lap each other. Also each separate program will be listed in blocks and not among themselves, but they still will run as one complete program.

```
0 PRINT"[CLR]":POKE53281,0:POKE53280,0:REM   +MERGE+: (C) WILLIAM & SIMON FONG
1 POKE55,0:POKE56,159:CLR S=40705:FORJ=STOS+78:READV:POKEJ,V:NEXT:NEW
2 DATA169,0,133,10,32,212,225,165,43,72,165,44,72,56,165,45,233,2,133,43,165
3 DATA46,233,0,133,44,169,0,133,185,166,43,164,44,159,0,32,213,255,176,14,134
4 DATA45,132,46,32,51,165,104,133,44,104,133,43,96,170,201,4,144,244,240,10
5 DATA104,133,44,104,133,43,24,128,0,3,164,186,136,240,209,208,239
```

# spectrum

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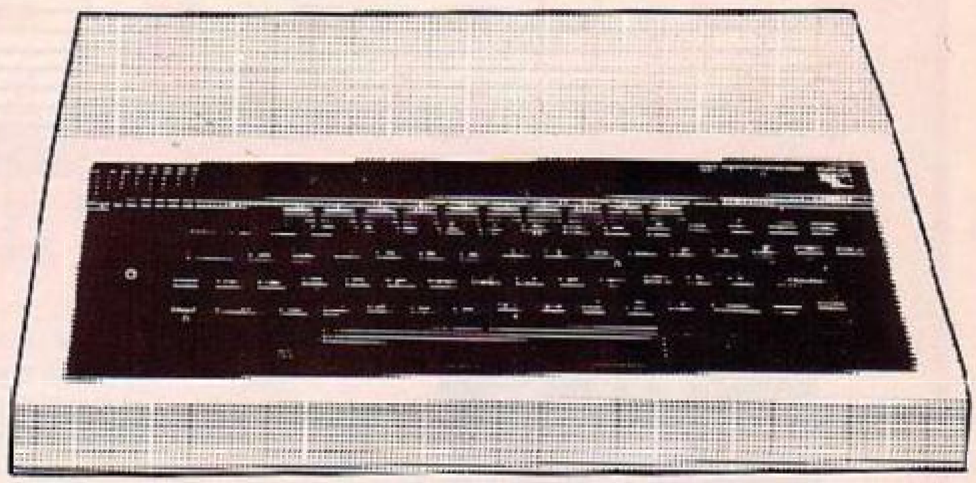
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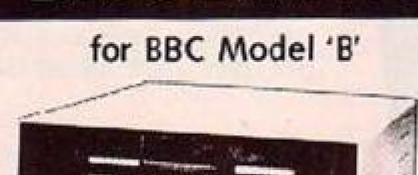
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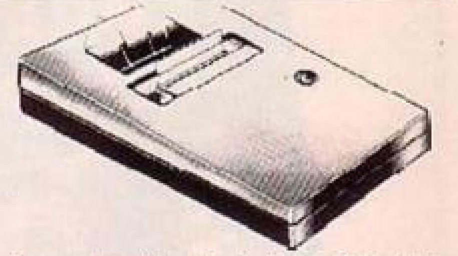



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# spectrum

## MICRO DEALER UK's TOP 50

### Britains No.1 Weekly Software Chart




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|---|---|---|---|
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| Night Gunner | Digital | Spectrum | £6.95 |
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| Elade Alley | PSS | Spectrum | £5.95 |
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| Gyropod | Tasket | CEM 64 | £6.90 |
| Trashman | New Generation | Spectrum | £5.95 |
| Solo Flight | MicroProse | CEM 64 | £14.95 |
| Jet Set Willy | Software Projects | Spectrum | £5.95 |
| Fligh: Path 737 | Anirog | VIC 20 | £7.95 |
| Space Pilot | Anirog | CEM 64 | £7.95 |
| Code Name Mat | Micromega | Spectrum | £6.95 |
| Elagger | Alligata | BBC | £8.95 |
| Football Manager | Addictive | Spectrum | £6.95 |
| Son of Blagger | Alligata | CEM 64 | £7.95 |
| Elue Thunder | Richard Wilcox | Spectrum | £5.95 |
| Moon Alert | Ocean | Spectrum | £5.90 |
| Ad Astra | Gargoyle Games | Spectrum | £5.95 |
| Dinky Doo | Software Projects | CEM 64 | £7.95 |
| Zodiac | Anirog | CBM 64 | £7.95 |
| Millionaire | Incentive | Spectrum | £5.50 |
| Scuba Dive | Durrell/Martech | Spectrum | £5.90 |
| Forbidden Forest | Cosmi | CBM 64 | £8.95 |
| Omega Run 64 | CRL | CBM 64 | £7.95 |
| Fred | Quicksilva | Spectrum | £6.95 |
| Krakatoa | Abbex | Spectrum | £5.95 |
| Voodoo Castle 64 | Adventure International | CBM 64 | £9.95 |
| Chequered Flag | Psion | Spectrum | £6.95 |
| Revenge of Mutant Camels | Llamasoft | CBM 64 | £7.50 |
| Eagle Empire 64 | Alligata | CBM 64 | £7.95 |
| Hunchback 64 | Ocean | CBM 64 | £6.90 |
| Mugsy | Melbourne House | Spectrum | £6.95 |
| Sheep in Space | Llamasoft | CBM 64 | £7.50 |
| Mr Wimpey BBC | Ocean | BEC | £6.90 |
| Wheelie | Microsphere | Spectrum | £6.95 |
| Atic Atac | Ultimate | Spectrum | £5.50 |
| Football Manager BBC | Addictive | BEC | £7.50 |
| Guardian | Alligata | Electron | £7.95 |
| Cityattak | K-Tel | CBM 64 | £6.95 |
| Killerwat | Alligata | CBM 64 | £7.95 |
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| Pinball Wizard 64 | C P Software | CBM 64 | £7.95 |
| Classic Adventure | Melbourne House | CBM 64 | £6.95 |
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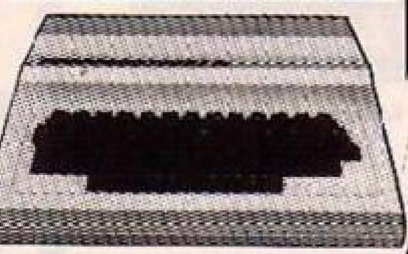
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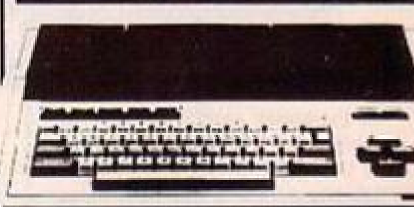


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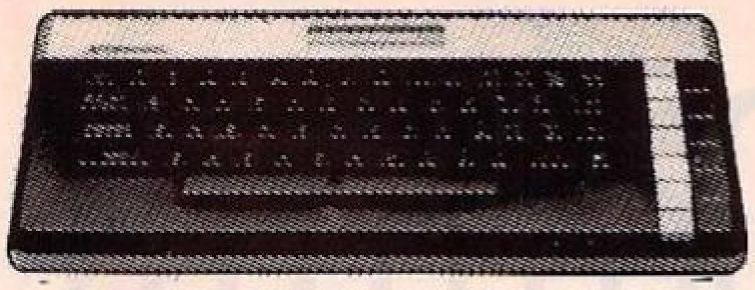
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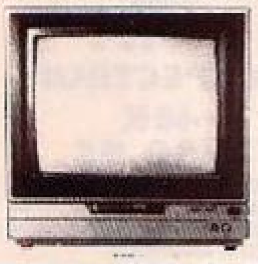
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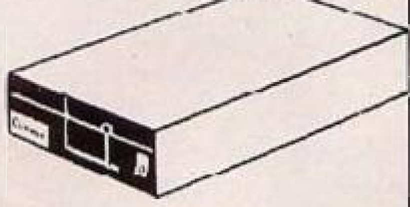
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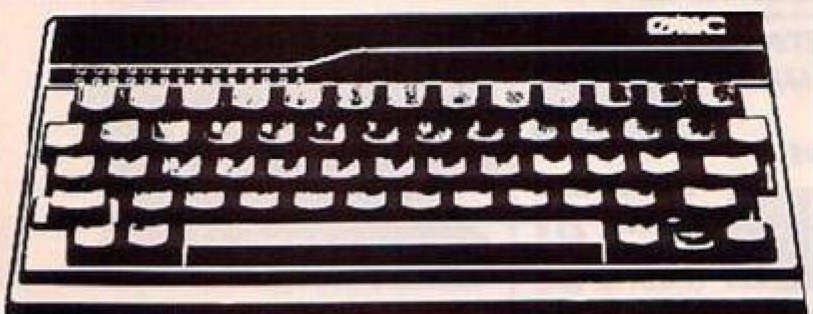
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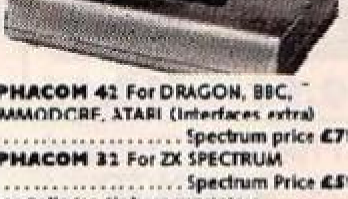
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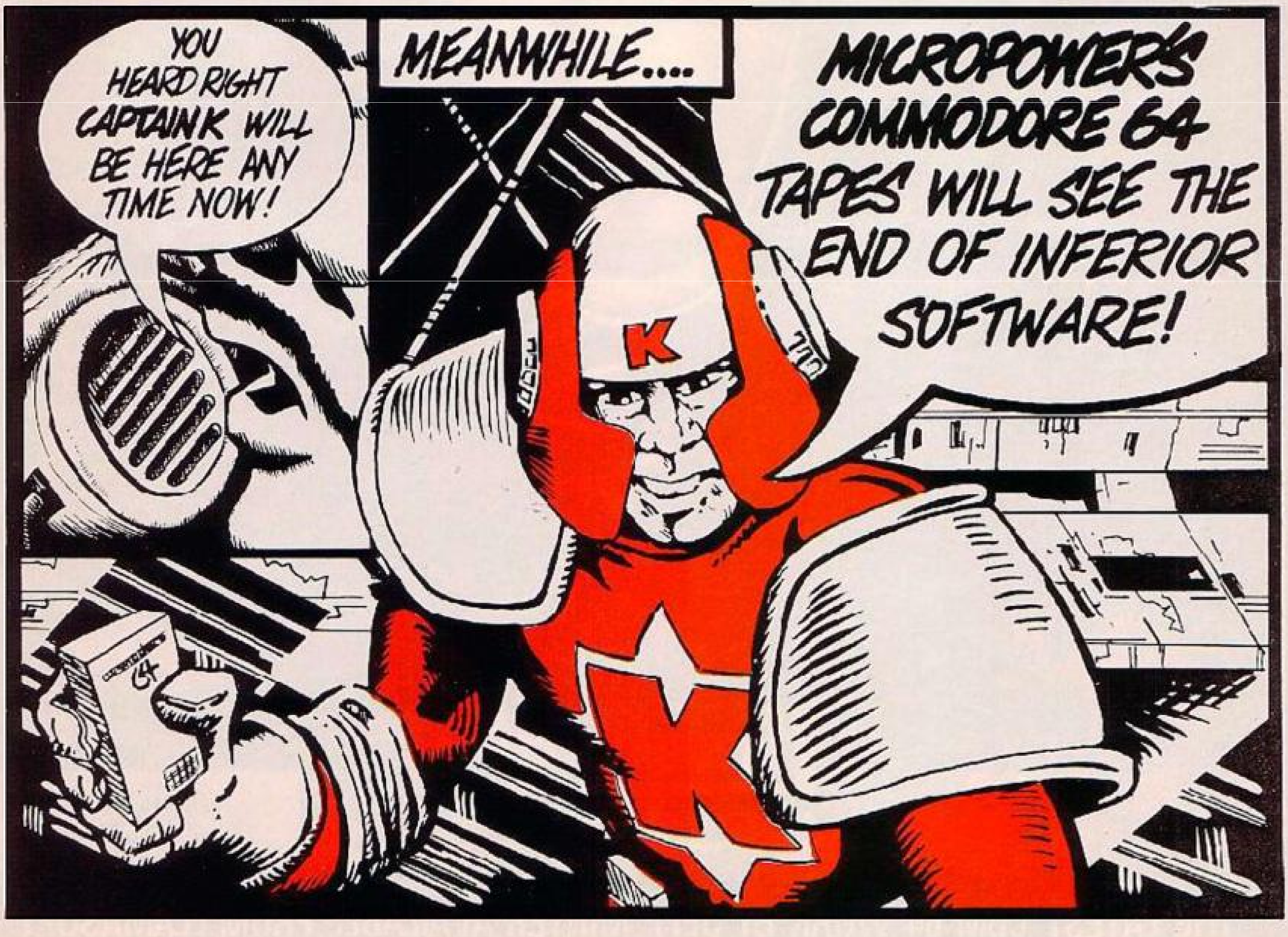
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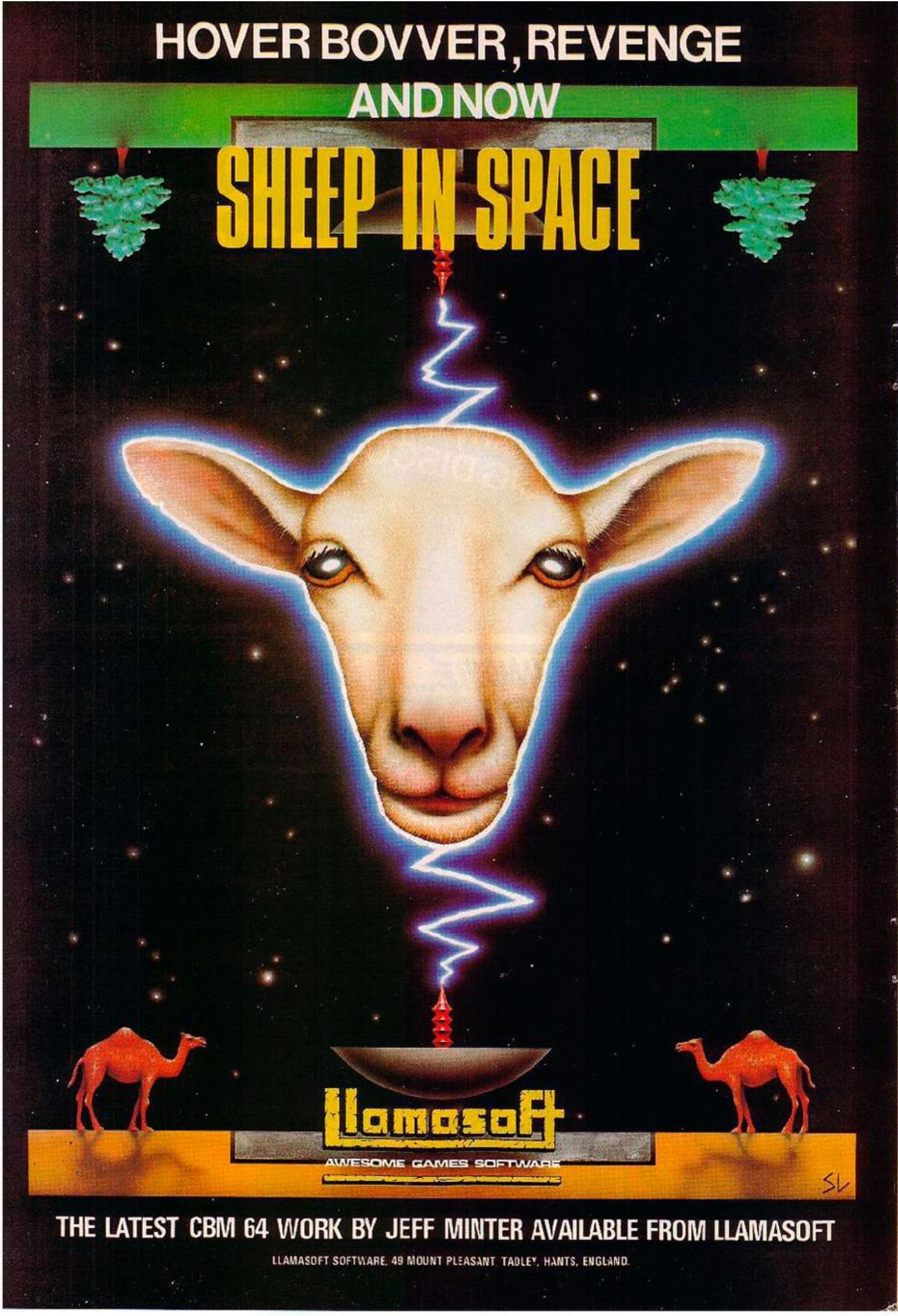
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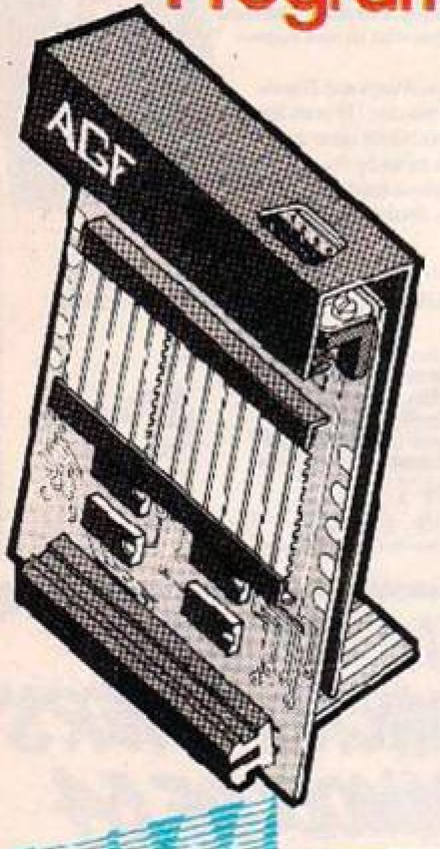
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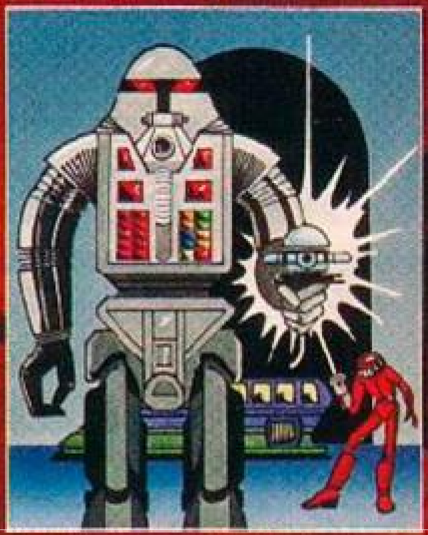


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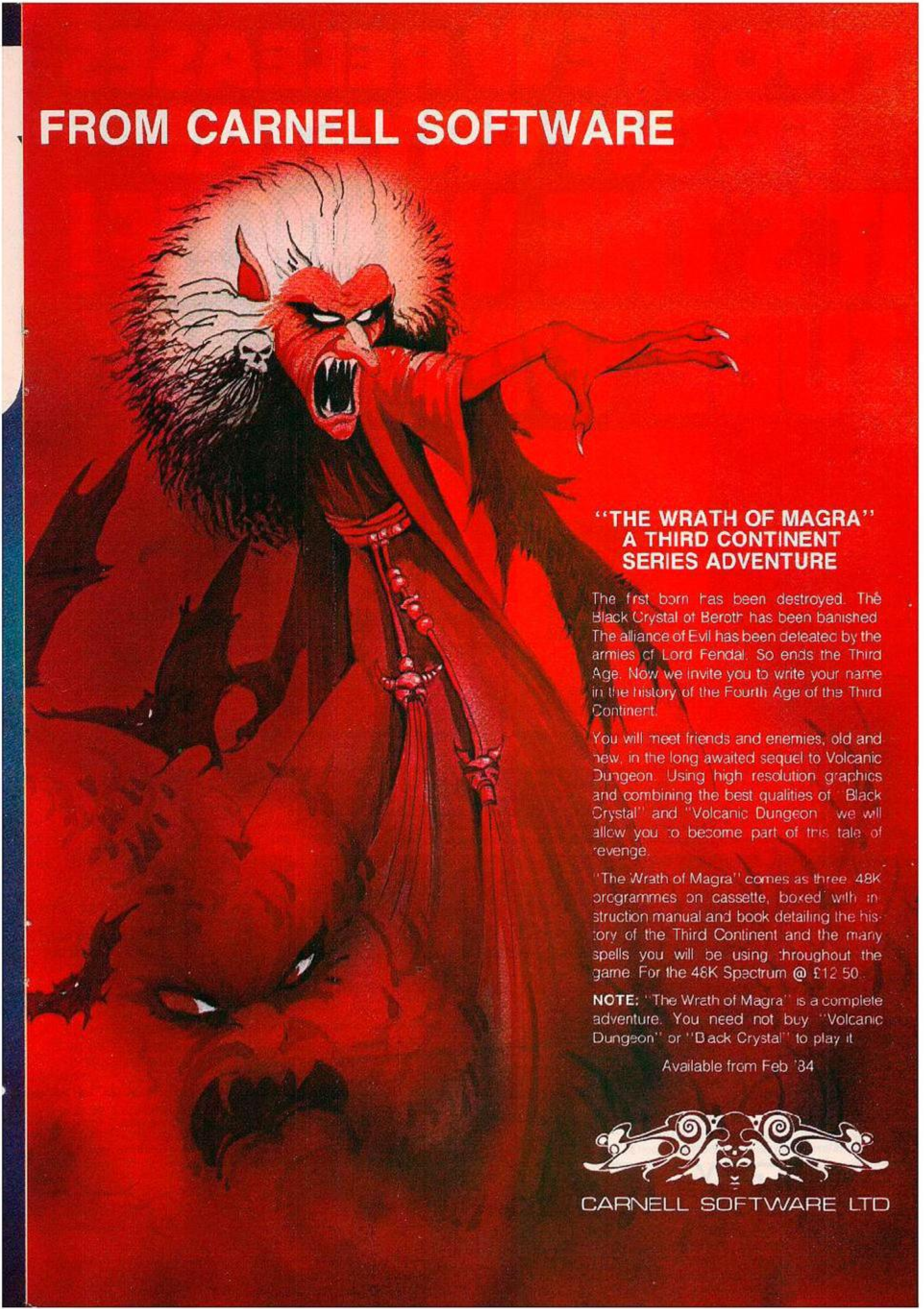
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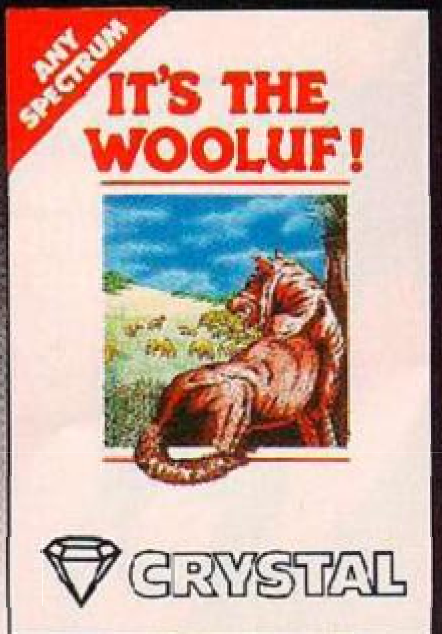
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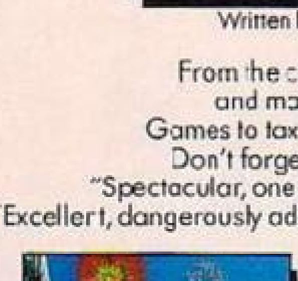

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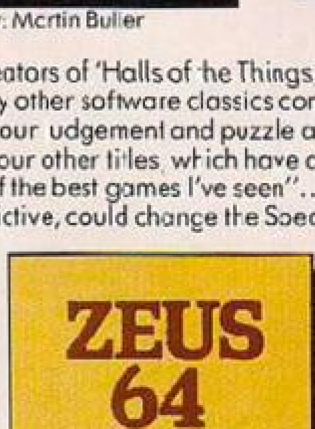
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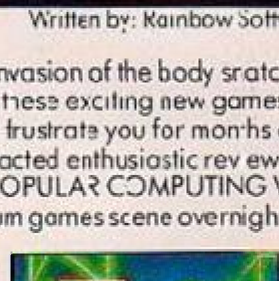
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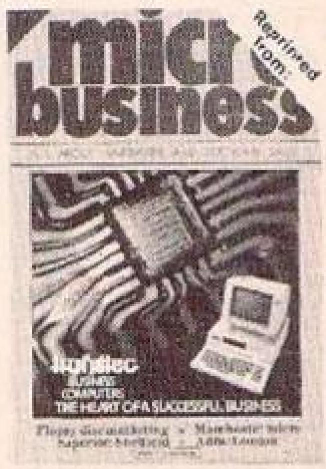
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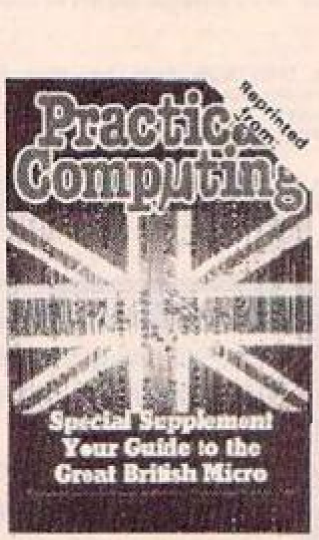
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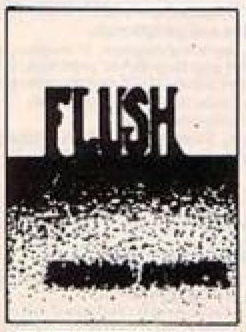
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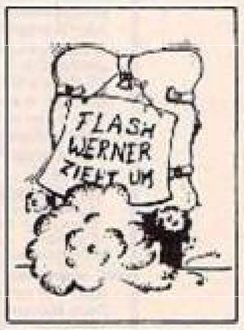
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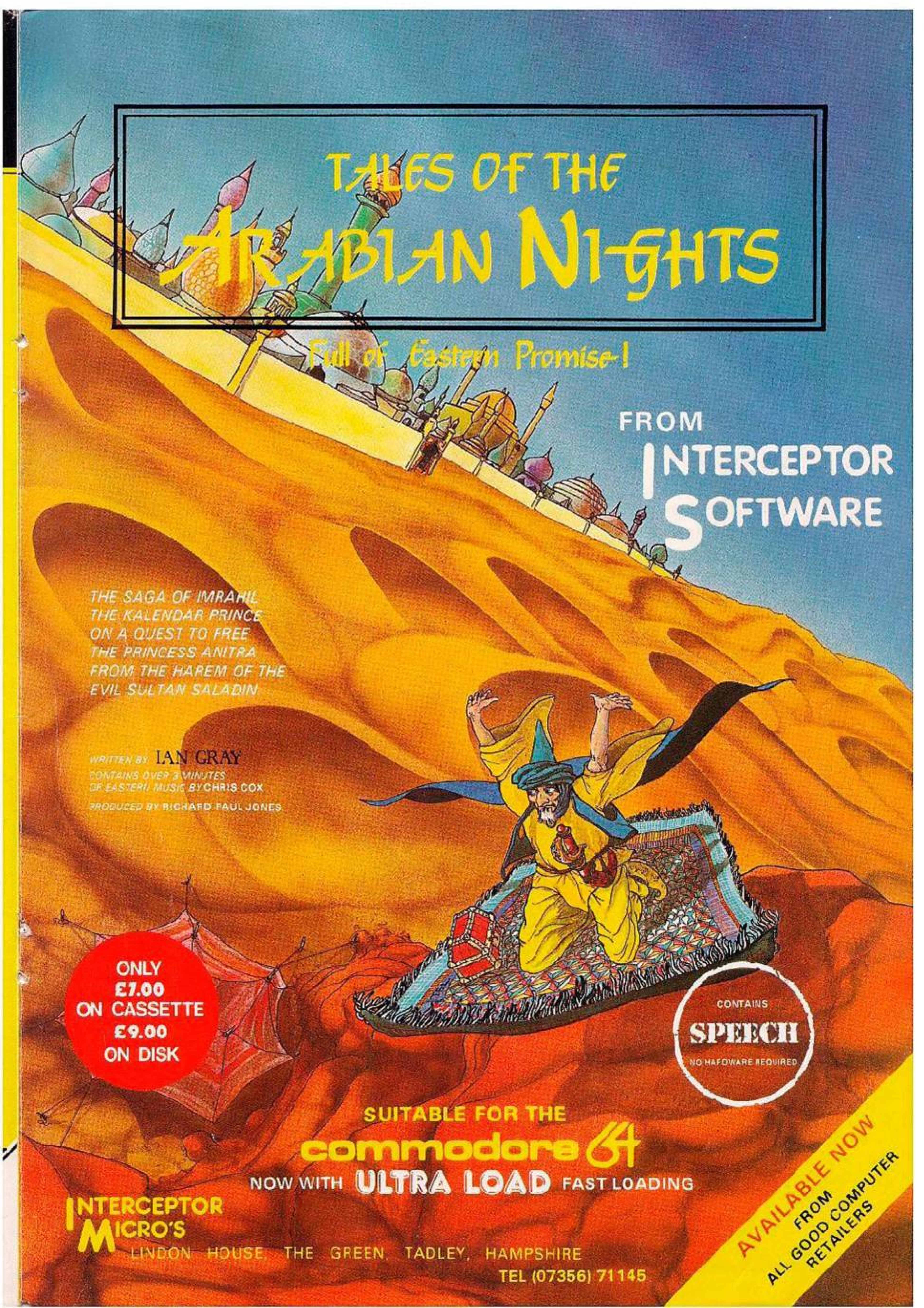
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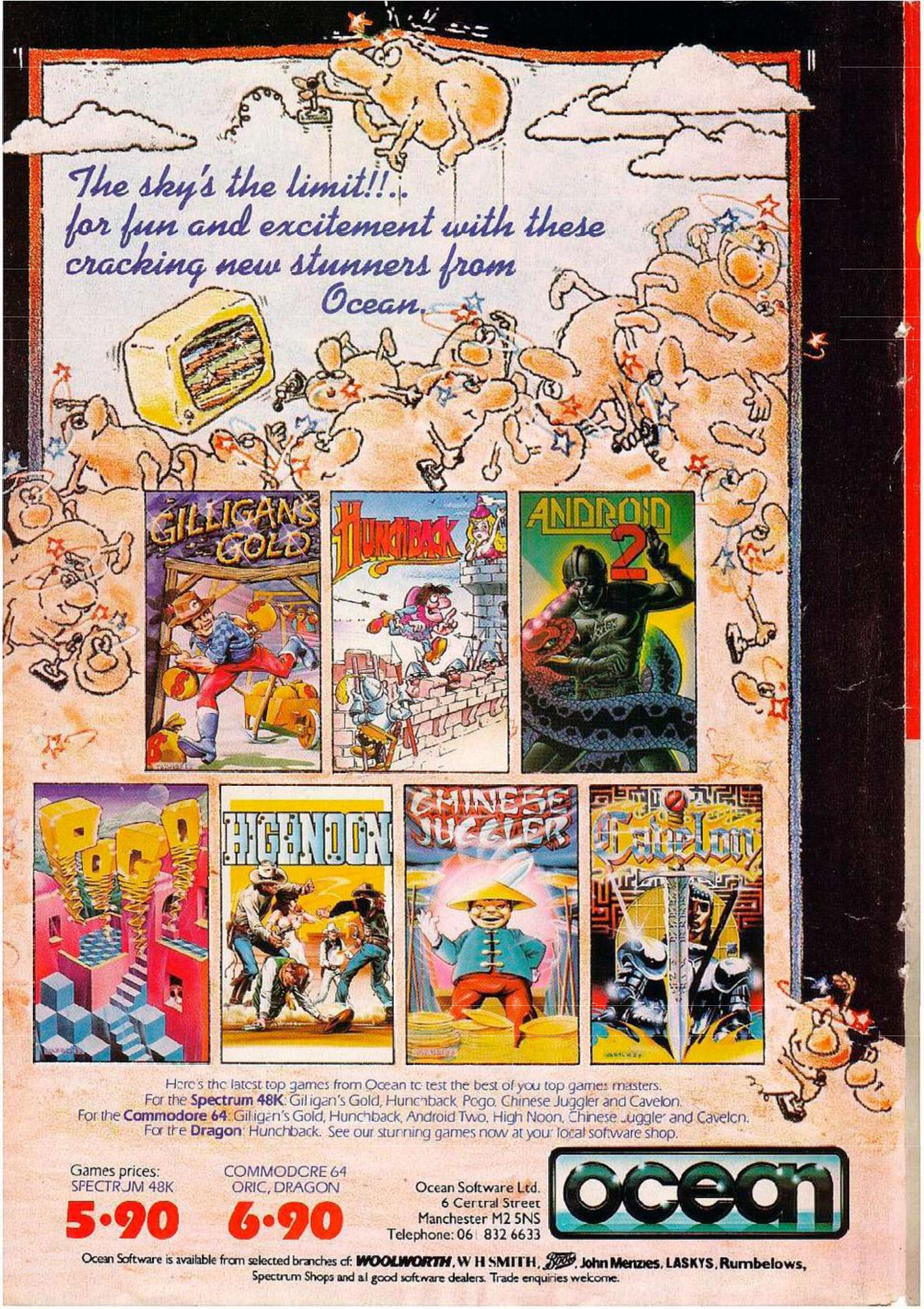
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